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AUGUST 2003

CQ

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On the Cover: Herb "Cal" Calvitto, WA1WOK, "goes fishing" for DX in New Hampshire. Details on page 92.

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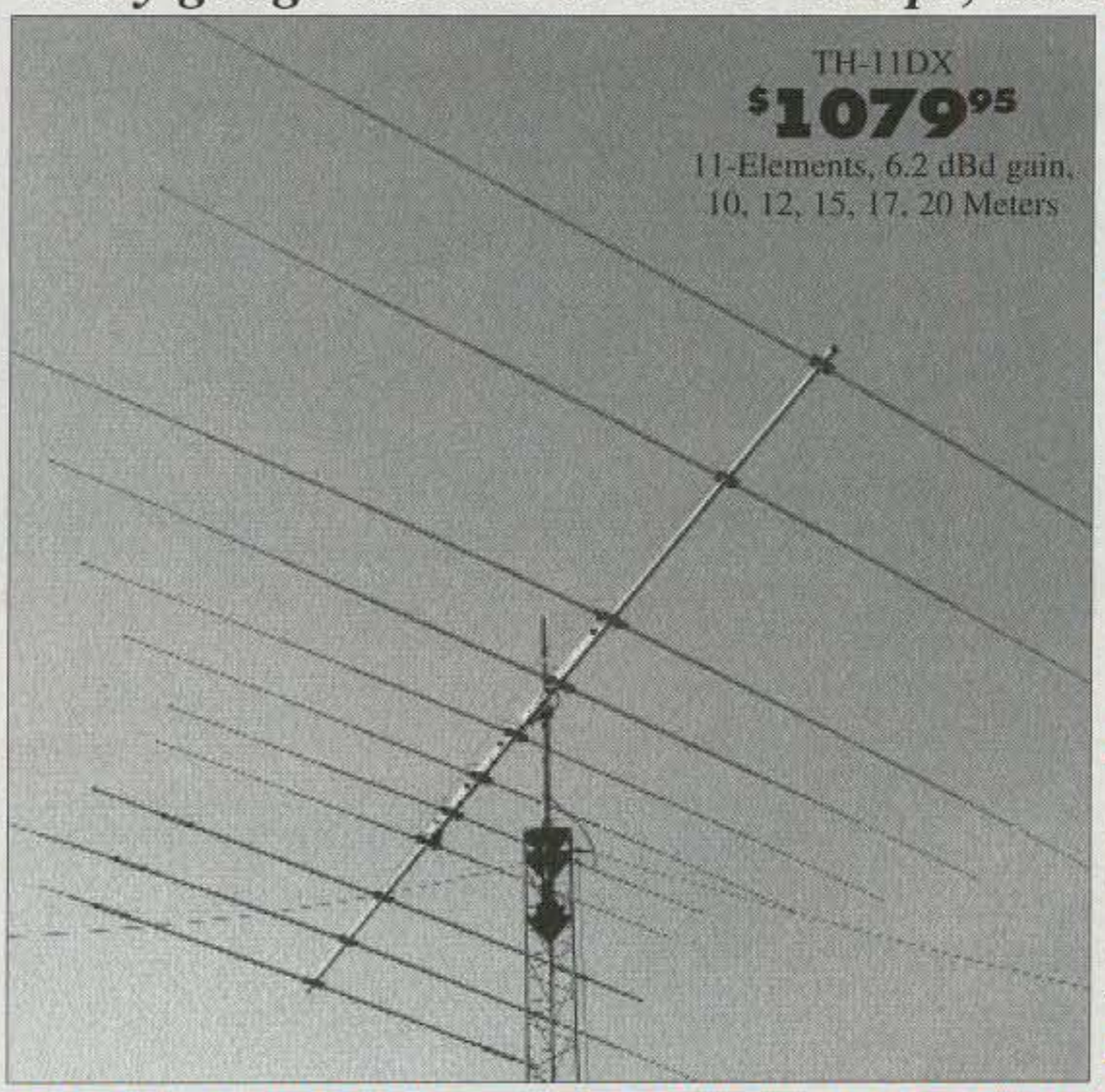

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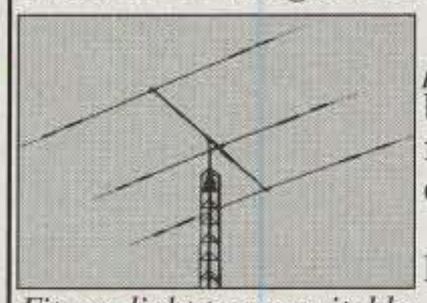

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TH-3JRS	3	5.8	25	600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$329.95
TH-2MK3	**2**	**3.4**	**15-20**	**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$339.95**
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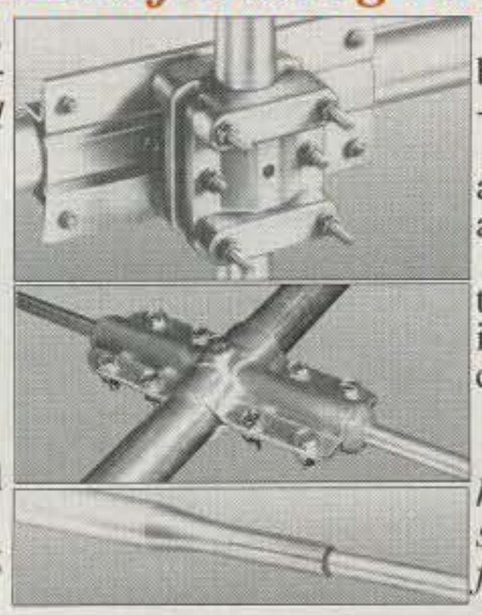

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ham radio news

New Ham Band Now Available

It may not be much, but it's ours ... along with the federal government's. The new 60-meter band at 5 MHz was opened for amateur use—on a secondary basis and under very tight restrictions—on July 3, 2003. The band consists of five discrete channels and operation is limited to upper sideband with a maximum effective radiated power (ERP) of 50 watts. See WB6NOA's operating guide on page 13 of this issue and W5YI's complete report on the FCC's decision on page 44.

WRC-03 Under Way in Geneva

The 2003 World Radiocommunication Conference (WRC-03) was in progress at press time, with delegates from around the world making decisions that will affect certain parts of amateur radio's future. Major ham-related issues on the table are a possible realignment of 40 meters to separate hams and international broadcasters; whether to continue requiring a Morse Code examination as an international requirement for an HF amateur license; and a request for satellite-based radar systems to operate in the 70-centimeter band (420–450 MHz). As we went to press, the conference was about halfway over, but no final decisions had been made. Look for details next month in W5YI's "Washington Readout" column.

Homeland Security Dept., ARRL Sign Affiliation Agreement

The ARRL has become formally affiliated with the U.S. Department of Homeland Security after an agreement was signed at the ARRL National Convention in Dallas on June 21. The Statement of Affiliation was signed by ARRL President Jim Haynie, W5JBP, and Ron Castleman, Chief Operating Officer of the Department of Homeland Security's Emergency Preparedness and Response Directorate (formerly the Federal Emergency Management Agency). According to the ARRL, the statement includes provisions calling on the ARRL and DHS to collaborate on matters such as raising public awareness of amateur radio as a public-safety resource and providing training and accreditation for amateur radio emergency communications. The League will also work with DHS in support of Citizen Corps councils.

Ron Castleman (left), Chief Operating Officer of the Emergency Preparedness and Response Directorate of the US Department of Homeland Security (DHS), and ARRL President Jim Haynie, W5JBP, sign a Statement of Affiliation between the ARRL and DHS. (Photo by Jeff Reinhardt, AA6JR)

Haynie Testifies Before Congress

ARRL President Jim Haynie, W5JBP, addressed a Congressional subcommittee in June on the need to pass a law requiring the FCC to provide "equivalent replacement spectrum" to the Amateur Service if it reassigns any current amateur allocations. The bill is HR 713, also called the Spectrum Protection Act of 2003. Haynie testified at a hearing on "The Spectrum Needs of Our Nation's First Responders" held by the Subcommittee on Telecommunications and the Internet. He told the members that ham radio is "indeed a first responder," and that hams can and do respond "when all other systems of communications fail, including public-safety communications when they're overloaded, destroyed or lack interoperability."

FCC Threatens to Fine Power Company

An Ohio-based power company that did not respond to an FCC letter regarding interference to hams has been threatened with enforcement action—generally a fine—if steps are not taken promptly to resolve the issue. American Electric Power Company of Columbus, Ohio was originally notified last November of interference complaints from three amateurs in Ohio and Indiana. According to the new letter, no action was taken to resolve the problems and the utility did not contact either the ARRL or the FCC within the 60-day period outlined in the first letter. The utility was given an additional 20 days to respond to the second letter or face possible enforcement action. In May and June five other utilities in different parts of the country also received FCC letters advising them of interference problems and instructing them to work on resolving the situations over the next 60 days.

Citizens Cited for Cordless Phone Interference

A ham in Vienna, Virginia is getting help from the FCC in battling interference from neighbors' cordless telephones. Two neighbors of Bernie Keiser, W4SW, have been sent FCC advisory letters telling them that their phones are causing interference, that harmful interference from an unlicensed device to a licensed radio service is a violation of FCC rules, and that it is the responsibility of the owner to make sure the device is operated without causing interference. The letters urged the parties to resolve the problems without FCC intervention and suggested trying to get the seller or manufacturer of the phones to exchange them for models that don't cause interference.

In a similar case, a Florida couple has received a letter regarding apparent interference caused by their electric fence charger. In this case, the letter points out that their local power company has confirmed the charger as the source of the interference.

Nextel Trademarks "Push-to-Talk"

Believe it or not, the term "push-to-talk" and its abbreviation, "PTT," are now trademarks of Nextel Communications, Inc. According to Forbes.com and other sources, the wireless phone company says the U.S. Patent and Trademark Office had approved the applications to trademark both "push-to-talk" and "PTT" in an effort to prevent competitors planning to introduce cell-phone walkie-talkie service from using the terminology. There's no word yet on whether the trademarks apply only to wireless telephones or more broadly to commercial and amateur two-way radios. If so, we may all really *need* to start calling those buttons "release-to-listen" switches.

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BY RICH MOSESON, W2VU

Personal Sunspot Cycles

I was tuning around on 20 meters the other day when I stopped to listen in on a contact in progress. There appeared to be three or four hams in the QSO, and they seemed to be talking about what a lot of us talk about—new rigs on the horizon and various people's on-air activity levels. One of the hams, whom I later determined to be KK7TV, caught my attention with a comment that "I think we all have our personal sunspot cycles."

What a concept! What a perfect analogy to the way many of us live our ham radio lives!

I contacted Randy Starace, KK7TV, and asked exactly what the "personal sunspot cycle" meant to him. Randy responded:

"Yes, I do go through spells of not being active on the radio. But it's not like my antenna is down or the rig is broken, these circumstances would cause yours truly to triple his efforts to get back on the air. No! It's knowing that the ham shack is functioning 100%, but my ability to make a contact is buried somewhere between another hobby or the endless list of 'to do's.' I walk by my shack and look in—yes, all my stuff is still there—but then I keep on walking to another part of the house without the slightest urge to turn on the rig. This will go on for days or even weeks. My lovely wife gets a puzzled look on her face and asks if I am okay. I say yes, I feel fine. She replies, 'I haven't heard that noise coming from your shack in quite a while.' I think for a second and reply, 'I must be going through my sunspot cycle.'"

Randy's response is particularly interesting to me because his interpretation of his comment is a little different from mine. Randy sees the "cycle" as short-term, with daily or weekly variations in available time or interest for operating. I see it more broadly—the sunspot cycle, after all, is 11 years long, and some even theorize that it's really a 22-year cycle.

There are those of us—Randy, no doubt, myself, and many of you—for whom some level of amateur activity is a constant over the course of decades. I've been licensed over 30 years and while there have been periods when other demands on my time took precedence over ham radio, I can't think of any full year in which I've been totally off the air. My operation may have been limited to getting on 2-meter FM while traveling, but there's always been something.

On the other hand, there are many people who, for whatever reason, have temporarily become completely inactive. I say temporarily because they don't seem to be letting their licenses lapse. In fact, they seem to be renewing their licenses in near-record numbers, and these renewals are sustaining the ongoing growth of amateur licensing totals. This is a reversal of a trend of a couple of years ago, when renewal rates appeared to be down. This is good, since the numbers of new hams is holding fairly steady in the neighborhood of 21,000 per year.* But total renewals jumped from 23,400 in 2000 to 42,700 in the year ending this past May 31, an increase in renewals of some 83%! Perhaps this is just a reflection of the larger number of new licenses issued in 1992 and '93, after the code requirement for the Technician Class was dropped, than in 1990, but even so, it means that large numbers of those early "code-free Techs" are renewing their licenses. This is good.

However... as of May 31, 47% of all licensed hams in the U.S. were Technicians, and as most anyone who makes a habit of monitoring the VHF bands will tell you, you won't find 47% of amateur activity on VHF. And anyone who makes a habit of monitoring the HF bands will tell you that nowhere near the approximately 400,000 U.S. hams licensed to operate there actually are. The simple fact is that a large number—probably a majority—of our 687,000 licensed hams are inactive. This is bad. Or is it?

Have these people lost all interest in amateur radio? Or are they simply at low points in their personal sunspot cycles, with plans to get back on the air as soon as they get time ... even if that takes several years, just like the real sunspot cycle? An ongoing reserve of future activity for which the hardest part—licensing—has already been done?

I vote for the personal sunspot cycle theory. Certainly, there are some licensees who have lost interest and who will drop off the licensing rolls two years after their licenses expire. In the year ending May 31, over 25,000 hams let their licenses lapse. But over 40,000 hams renewed their tickets in the same period.

Some estimates of amateur activity levels are that only one in six licensees is active at any given time, which would give us just under 115,000 active hams in the U.S. Given an even distribution across a 10-year license term, that means that on average, 11,500 of these active hams would need to renew their licenses in a given 12-month period. But there were 40,000 total renewals between June 1, 2002 and May 31, 2003, meaning that some 28,500 "inactive" hams also renewed. Why bother if you're not planning to someday become active again?

Another factor in favor of the personal sunspot cycle theory: I am constantly meeting or hearing from people who have been inactive for years and now want to get back on the air. Some of them have maintained their licenses, others have let them lapse. But in all cases, there had been a peak of personal interest some years ago, then life got in the way and their interest waned, and now it's rising again, just like the sunspot cycle. They're coming back, and we all should welcome them with open arms just as we welcome the return of the sunspots. As for those who are currently inactive, I have faith that someday, they'll be back.

On-Air Excitement

The real sunspot cycle, of course, is in decline. Conditions on HF this spring were pretty bad, and we're going to have to go through some very low spots before the spots start coming back in three-to-four years. But that doesn't mean it's time to dive into your own sunspot minimum. We've got a new band, such as it is, to experiment with at 5 MHz, also known as 60 meters. The five discrete frequencies were opened to amateur use on July 3rd. Now some of you may scoff at a ham band of five channels, with power limited to 50 watts ERP (effective radiated power), and operation limited to upper sideband. Some of you may agree with the *CQ* reader who wrote that the new band was an "insult" to amateurs and that he would never operate there. On the other hand, I'm sure there are many of you who look forward to the opportunity to discover who and where you can work on 5 MHz and to the challenge of sharing a DX-capable HF band with not only other hams but also government users such as the Coast Guard and the Justice De-

*All licensing statistics from AHØA's website, <http://ah0a.org/FCC/index.html>.

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partment. Contributing Editor Gordon West, WB6NOA, provides an excellent guide to getting started on 60 meters. I highly recommend that anyone anticipating operating on this band read this article, to learn such things as where to tune your VFO to be "spot on" the correct frequencies (it's NOT the frequencies listed in the FCC's Report and Order), or how to determine your ERP if you're using something other than a dipole antenna.

There's more exciting news up on VHF, specifically on 222 MHz. It's long been thought that sporadic-*E* propagation *should* be able to reach 222 and make long-distance communication possible here, but until now, only one or two instances of *E*-skip contacts on the band have been reported. Well, this spring has had some tremendous *Es* openings on 6 and 2 meters, and in mid-June, at least one of those big-time openings reached all the way up to 222 and the band stayed open for nearly two hours, with contacts made between Arizona and Washington State. At the same time, 2 meters and 6 meters were also wide open, with a lot of Caribbean and African DX on 6. Read N6CL's "VHF-Plus" column this month (which he's been updating right up to deadline) for all the details.

Welcome to *RTTY Journal* and *W5YI Report* Readers

We would like to extend a warm welcome to *CQ* to readers of *The New RTTY Journal* and the *W5YI Report,* both of which have ceased publication. Their respective publishers have arranged to have their readers' remaining subscriptions fulfilled by *CQ,* based on the value of the remaining portion of each subscription. If you are already a *CQ* subscriber, your subscription will be extended by the appropriate number of issues. If you start getting two (or three!) issues of *CQ* each month, gather them all up, call our customer service number at 800-853-9797, and we'll get it all straightened out.

Amateur radio is the poorer for the loss of these publications. *The New RTTY Journal* and its predecessors have been part of the amateur radio landscape for more than 50 years. Fred Maia, W5YI, spent a quarter-century bringing hams the latest news of amateur radio and the broader electronics industry on his familiar pink bi-weekly newsletter. Fred will continue to write his monthly column in *CQ* and he explains his decision to shut down the *W5YI Report* in his column this month. In addition, we've received reports that the Australian magazine, *Radio and Communications,* has ceased publication and that a regional on-air news program in the Midwest, "Amateur News Weekly," has gone QRT.

Specialty magazines have never had an easy time in amateur radio simply because there are so many specialties. In addition to the general interest magazines and organizational journals, the U.S. market today supports one VHF magazine, one contesting magazine, one technical magazine, and one amateur television magazine. People who are active in these parts of our hobby owe it to themselves and to the activities they enjoy to support these publications that help promote the things they like to do. The specialty magazines will not survive on their own. (Neither will the general-interest magazines, but we have a broader base on which to draw.)

Likewise, while independent on-air news services rely on volunteers to submit news stories, they still incur significant costs in production and distribution. Since they air on amateur frequencies, they may not carry advertising. So they must rely on direct financial support from the people who benefit from listening to their news reports.

The strength and vitality of our hobby lies not only in getting people licensed and on the air but in supporting the "infrastructure" that binds us together as a community. The ARRL, community-wide (general interest) magazines, specialty magazines and independent news sources are all essential ingredients in the long-term health of amateur radio. They all need your ongoing support.

73 de W2VU

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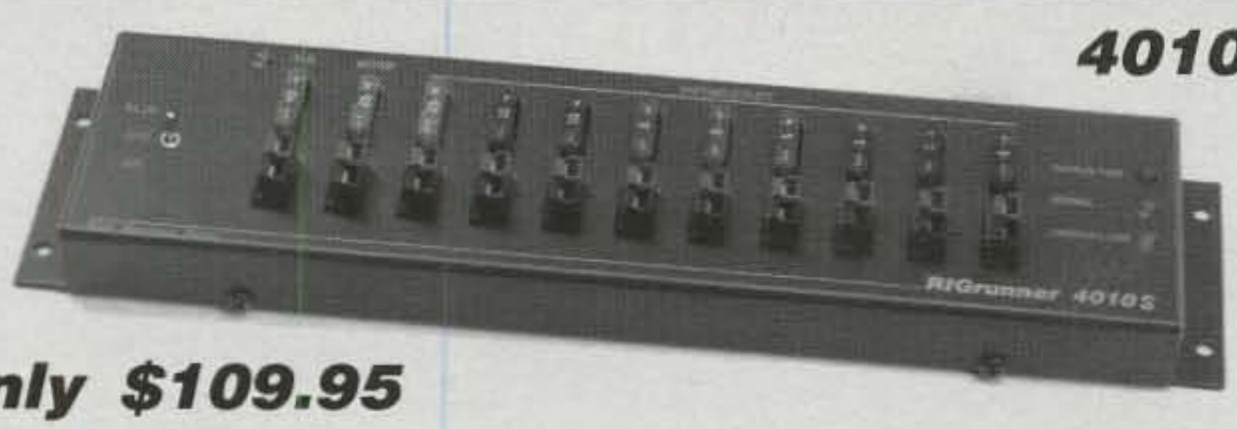

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- Dual 32-bit floating point ADI SHARC DSPs. Two 32-bit processors deliver significantly more processing "horsepower" than a single 32-bit radio can provide.
- Unmatched close-in HF receiver performance on the main receiver. Very high receiver intercept points and superior dynamic range are made possible by an industry-best low phase noise synthesizer, selectable crystal roofing filters and dual 32-bit DSP processing power.
- Two receivers, with an amateur-bands-only main receiver and general coverage subreceiver. Each receiver has fully programmable AGC characteristics and 590 IF-DSP filters standard. Receivers can be used separately or in tandem for diversity reception on any frequency with no compromise in RX performance. Use both receivers on a single antenna, or both on separate antennas.
- ORION is equipped with dual antenna outputs, two linear amplifier keying outputs, two band-data connections. This allows two sets of amplifiers and antennas to be connected to the radio simultaneously to take full advantage of both receivers' capabilities.
- Continuous real-time spectrum display with 5 selectable widths.
- Adaptive DSP noise reduction filtering available in 9 stages. Dual noise blankers, both DSP and 'analog' are provided.
- Optional heavy-duty internal automatic antenna tuner matches up to 10:1 SWR (8 to 600 ohms load impedance).
- Panoramic Stereo™ receive. PS receive allows signals heard through headphones to 'move' across the spectrum spatially as they are tuned across. Makes copying a single signal in the presence of multiple signals on the same frequency (like a contest or DX pileup) much easier than with 'mono' output.
- SSB audio receive and transmit controls. 18 transmit bandwidths to a maximum of 3.9 kHz are provided along with equalization on both transmit and receive. Bass and treble response can each have their own EQ setting.
- Flash-ROM update capability allows an ORION owner to instantly upgrade their radio to the latest version by downloading a file from the Internet – free of charge.

MADE IN THE USA

HOW IS ORION DIFFERENT?

For the complete technical description of the ORION and/or to download the operator manual in .pdf format, visit our website at **www.tentec.com.**

ORION uses both crystal roofing filters and IF-DSP bandwidth filtering as part of the main receiver. The usual pitfall for top-notch performance in a modern HF receiver is the use of a 15- to 20-kHz wide roofing filter at the 1st I-F stage. This wide filter will allow unwanted signals outside of your receiver's passband to compromise receiver performance. By using crystal filters as selectable roofing filters at the 1st I-F, undesirable signals are kept out of the receiver chain and do not compromise close-in receiver performance.

Any signal that appears inside the roofing filter – even if you do not hear it in your receiver passband – will have a negative impact on receiver performance. Loud signals inside a roofing filter lead to a loss of dynamic range and receiver sensitivity. Consult any ARRL product review from the past two years and look at the difference in receiver performance numbers for 20-kHz spacing and 5-kHz spacing two-tone dynamic range and third-order intercept. The 5-kHz spacing numbers are always significantly worse than the 20-kHz numbers for our competitors transceivers – this is because of the presence of the loud test signals under their wide roofing filters. Imagine how much worse it is if you have several loud signals within 15 kHz rather than just two used for testing! The optimum receiver set up is to use high-rejection, very narrow crystal filtering up front, and brick-wall DSP filtering at the end of the chain at the 3rd I-F. No receiver system can top this! There are six crystal roofing filter positions in ORION. Three roofing filters at 6 kHz, 2.4 kHz, and 1 kHz are standard; three at 1.8 kHz, 500 Hz, and 250 Hz are optional. ORION's roofing filters are not to be confused with traditional crystal bandwidth filters – for bandwidth filtering, ORION has 590 built in DSP filters from a minimum of 100 Hz to a maximum of 6 kHz. What is the result? Receiver performance specifications that are significantly better than any other transceiver on the market to date.

OPTIONAL EQUIPMENT

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Not shown: #217-218-219 Optional Roofing Filters – $109.00

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announcements

Amateur Radio Lighthouse Society Contest – The ARLHS Pan-American Lighthouse-Lightship Weekend contest will be August 2–3 in conjunction with National Lighthouse Week to celebrate the lighthouses and lightships of North, Central, and South America and includes participation by light beacons around the world. For details see <http:arlhs.com/PALLW-2003.html> or send an SASE to the ARLHS, P.O. Box 2178, Riverton, NJ 08077 (e-mail: <k2jxw@arlhs.com>).

NARTE Net – The National Association of Radio Telecommunications Engineers, in affiliation with the ARRL, has registered an HF amateur radio net called The NARTE Net. Sessions open a forum for the common interests of ARRL members and NARTE certified professionals. All hams are welcome to check in. Times: Saturdays at 1700Z and Sundays at 2100Z both days on 18.1400 MHz.

W7BX/7J1ABV Memorial Award – The Tokyo International ARA is accepting nominations for its first W. Sandy Lynch (W7BX and 7J1ABV) Memorial Award. It will presented each year to one licensed amateur radio operator in the world who exemplifies Lynch's dedication to the hobby. Criteria include enthusiastic participation in a radio club, bridging international cultures, involvement in education or Elmering, being active on the air, enthusiasm for new technology, and fraternity. Nominations may be submitted by any amateur or organization by October 31. To make a nomination or for more information, e-mail <tiara@bosai.org> or write to TIARA, P.O. Box 119, Akasaka, Minato-ku, Tokyo 107-8799, Japan. A memorial home page for Lynch is at <http://www.w7bx.org>.

• **The following special event stations will be on the air in August:**

W2GSB/Lighthouse, from Fire Island Lighthouse (ARLHS #256, IOTA NA-026), Fire Island National Seashore, NY; Great South Bay ARC; 1400–2200Z Aug. 16 & 17, SSB near IOTA frequencies, CW as announced. For QSL send QSL and SASE to W2GSB/LH, P.O. Box 1356, West Babylon, NY 11704 (DX QSL may via the bureau.) Info: <info@gsbarc.org>.

W3SSA, from 68th anniversary of Social Security Act; Maryland; SS Employees ARC; 1300–2200Z Aug. 9 near 7.275, 14.275, 21.275, 28.475 MHz. For certificate send SASE to Greg Stec, K2ANG, 1624 Pickett Rd., Lutherville, MD 21093, or electronically to <ac3p@arrl.net>.

W4GBR, from World's Longest Yard Sale, near Ft. Payne, AL; DeKalb ARC; Aug. 2–10 (no times given) on 28.470, 21.270, 14.270, 7.270, 147.270 MHz. For certificate send QSL and $4US to W4GBR Special Event, 2113 Dogwood Blvd. NE, Ft. Payne, AL 35967. (See <http://worldslongestyardsalespecialevent.com>)

N8SL, from Sturgeon Point Light USA-823, Sturgeon Point, MI; South Lyon Area ARC; 0001Z Aug. 16 to 2359Z Aug. 17 on 7.270, 14.270, 21.370, 28.370 ±QRM. For certificate send QSL and SASE to WB8IIA.

W8AL, from 40th anniversary of Pro Football Hall of Fame, Canton, OH; Canton ARC; 1200Z Aug. 1 to 0300Z Aug. 4 on 7.265, 14.265, 21.365, 28.365 MHz. For certificate send QSL and SASE to Donald Perry, WQ8J, 968 Culverne Ave. NW, Massillon, OH 44647.

W9SM, to commemorate the return of the Pan-Am Games to Wausau, WI; Wisconsin Valley RA; 1700Z Aug. 23 to 2100Z Aug. 24 on 28.460, 21.360, 14.260, 7.260 MHz. QSL and SASE to W9SM, P.O. Box 363, Wausau, WI 54402-0363.

• **The following hamfests, etc. are scheduled for August:**

Aug. 2, **Juniata Valley ARC Hamfest,** Lewistown, PA. Contact JVARC, P.O. Box 73, Yaegertown, PA 17099, or call Cliff Bell, WB3IVX, 717-248-2616; e-mail: <wb3ivx@localnet.com>.

Aug. 2–3, **Rassemblement International,** Marennes near "Intermarché" rue Louis Jouvet, France. Sponsored by REF-Union 17. Contact Catherine, F8CIQ, at <f8ciq@f-job.net>.

Aug. 9, **Valdosta Super Tailgate/Hamfest,** Civic Center, Valdosta, GA. See <http://www.varc.net> for details.

Aug. 9, **Iron Range ARC Hamfest,** Alpha, MI. Contact LeRoy Anderson, N8WQG, 906-265-3960, e-mail: <leand@up.net>. (Exams upon request two weeks before hamfest)

Aug. 10, **Carroll County Tailgate-Fest,** Westminster, MD. See <http://www.qsl.net/~k3pzn>, or e-mail: <k3pzn@qis.net>. (Talk-in 145.410)

Aug. 10, **Hamfesters RC Hamfest,** Will County Fairgrounds, Peotone, IL. Contact Hamfesters Radio Club, P.O. Box 42792, Evergreen Park, IL 60805; e-mail: <wb9wfr@arrl.net>.

Aug. 10, **Hamfest by the Shore,** Bayville Fire House, Bayville, NJ. Contact Ed, WA2NDA, 609-971-2792; e-mail: <wa2nda@aol.com>. (Talk-in 146.910, PL 127.3; 443.350, PL 141.3; exams 11 AM)

Aug. 10, **Greentown, Indiana Hamfest,** Greentown Lions Club Fairgrounds, Greentown, IN. Contact L. B. Nickerson, K9NQW, 765-668-4814; e-mail: <k9nqw@arrl.net>; <www.grantarc.com/greentown.html>. (Talk-in 147.24, 146.79; exams)

Aug. 16, **Chanute Area ARC Hamfest,** Zion Lutheran Activity Center, Chanute, KS. Contact Keith rather, 620-431-0930. (Talk-in 146.745, PL 100).

Aug. 17, **Denver RC Hamfest,** Jefferson County Fairgrounds, Golden, CO. Contact Bryan Steinberg, KCØCUA, <kc0cua@arrl.net>; <http://www.qsl. net/w0tx/>.

Aug. 17, **Northern Berkshire ARC Hamfest,** Adams Fairgrounds, Adams, MA. Contact Alan, K1SAV, 413-446-8742; e-mail: <code.freak@verizon.net>; <http://www.nobarc.org/hamfest.htm>. (Talk-in 146.91–)

Aug. 17, **Gloucester County ARC Hamfest,** 4-H fairgrounds, Mullica Hill, NJ. Contact Harry Bryant, P.O. Box 496, Pennsville, NJ 08070 (856-678-6091). (Talk-in 147.780/.180, PL 131.8; exams 9:30 AM)

Aug. 17, **Warren ARA Hamfest/Motorcycle Show,** Trumbull Campus Kent State University, Warren, OH. Contact Renee McCaman, KB8SVF, 330-847-8478; e-mail: <mccaman@cboss.com>. (Talk-in 146.970; exams 9:30 AM)

Aug. 17, **MIT Radio Societies Hamfest,** Albany and Main St., Cambridge, MA. Contact Nick, KA1MQX,617-253-3776 (9–5 M–F); <http://web.mit.edu/w1mx/www/swapfest.html>. (Talk-in 146.52, 449.725/444.725 –PL 114.8)

Aug. 22–23, **Duke City Hamfest,** University of New Mexico Continuing Ed. Conference Center, Albuquerque, NM. Contact Richie Allen, KC5NZR, 505-242-0208; <kc5nzr@arrl.net>. (Talk-in 145.33–, 100 Hz; 444.00+, 100 Hz; exams)

Aug. 23, **St. Cloud ARC Hamfest,** St. Cloud Armory, St. Cloud, MN. Contact Jack Maus, WØMBD, 320-685-8295, <w0mbd@arrl.net>. (Talk-in 147.015, 146.940)

Aug. 24, **St. Charles ARC Hamfest,** St. Charles American Legion Hall, St. Charles, MO. Contact Ray Martin, 314-524-1521; e-mail: <remsr@earthlonk.net>. (Talk-in 146.67–)

Aug. 30, **Uniontown ARC Gabfest,** club grounds, Old Pittsburgh Rd., Uniontown, WV. Contact Carl, WA3HQK, 304-594-3779. (Talk-in 147.045+)

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T-2X, $649.95. *Extra heavy duty Tailtwister antenna rotator!* For large antennas up to 20 square feet wind load when mounted in-tower, or 10 square feet when mast mounted with optional support bracket. Triple 138 ball bearing race, strong electric locking steel wedge brake. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches. Accepts masts up to 2 1/16 inches diameter. Rotator size is 14 1/16Hx9 3/16D in.

CD-45II, $389.95. *Medium duty antenna rotator.* Handles antenna arrays up to 8.5 square feet windload area when mounted in-tower, or 5 square feet when mast mounted with supplied lower support. Dual 48 ball bearing race, disc brake system. Control Box has an illuminated directional indicator with North or South center of rotation scale, separate snap-action brake and rotation control switches with disc brake release. Accepts mast sizes up to 2 1/8 diameter. Includes light duty lower mast support, Rotator size is 17 1/8Hx8 D inches.

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Wind Load capacity (inside tower)	20 sq. ft.	15 sq. ft.	8.5 sq. ft.	3.0 sq. ft.
Wind Load (with mast adapter)	10 sq. ft.	7.5 sq. ft.	5.0 sq. ft.	1.5 sq. ft.
Turning Power (in pounds)	1000	800	600	350
Brake Power (in pounds)	9000	5000	800	450
Brake Construction	Electric wedge	Electric wedge	Disc brake	Disc brake
Bearing Assembly/How many	Tripl race/138	Dual Race/96	Dual race/48	Dual race/12
Mounting Hardware	Clamp plate	Clamp plate	Clamp plate	Clamp plate
Control Cable Conductors	8	8	8	5
Shipping Weight (pounds)	28	24	22	14
Effective Moment (in tower)	3400 ft/lbs.	2800 ft/lbs.	1200 ft/lbs.	300 ft/lbs.

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- CTCSS encode/decode w/tone scan
- Auto repeater • 107 alphnumeric memories

IC-756PROII All Mode Transceiver
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- 32 bit IF DSP
- Enhanced 5" color TFT w/spectrum scope
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- SSB/CW Syncronous tuning
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- Advanced CW functions
- 101 alphnumeric memories

IC-746PRO All Mode 160M-2M
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- 32 bit IF-DSP+ 24 bit AD/DA converter
- Selectable IF filter shapes for SSB & CW
- 102 alphnumeric memories

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- 12V Operation
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Dual Bands at a Single Band Price!
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- 70 alphnumeric memories
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Commercial Grade Rugged
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- 113 alphnumeric memories

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- Weather Alert

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- Weather alert
- Weather channel scan
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- Backlit remote control mic

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5 MHz, 5 channels—not only a new band for ham operators (as of July 3), but new operating skills to take turns and develop roundtables on five discrete frequencies, with tightly limited power output.

Getting Ready For 60 (Meters, That Is)

A 5 MHz Operating Guide

BY GORDON WEST,* WB6NOA

The new 60 meter band, which became available to amateurs on July 3, is unlike any other amateur band. In order to prevent interference with current government users, such as the U.S. Coast Guard, the FCC has placed significant restrictions on amateur operations here. Hams are authorized to operate only on five specific frequencies—only in upper sideband (USB), with a maximum bandwidth of 2.8 kHz, and a maximum *effective radiated power* (ERP) of 50 watts. Since channelization and ERP are unfamiliar to many hams, *CQ* presents this basic 5 MHz operating guide. We'll start with the frequencies.

A Channelized Ham Band

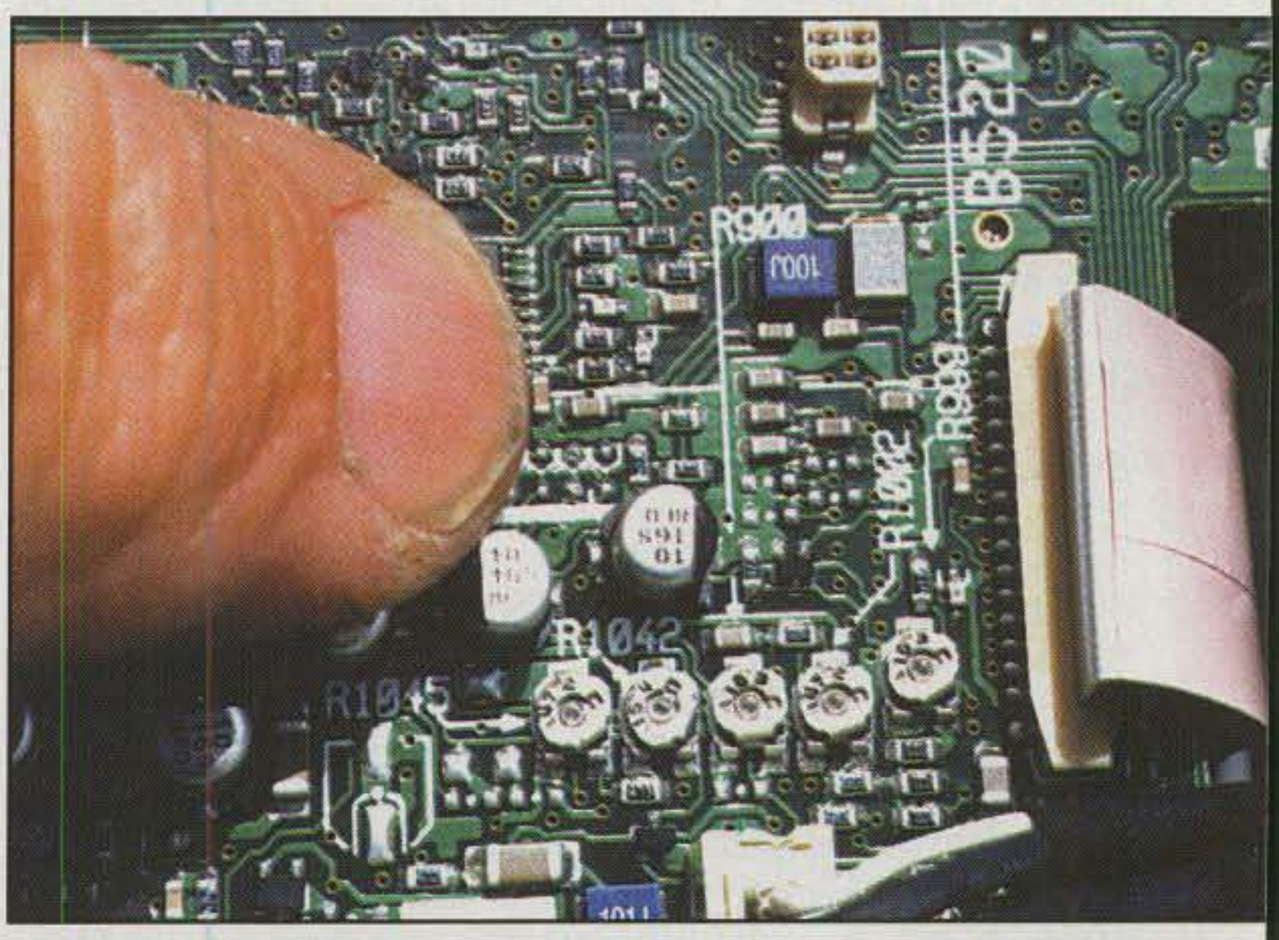
If you started out your radio activity on CB, the concept of channels is familiar to you. However, ham radios tend to have VFOs, not channel selectors, and dealing with SSB is different from operating AM. First of all, the center channel frequencies that have been listed in numerous news announcements are *not* the frequencies that will show up on the frequency display of your modern ham transceiver, since the USB frequency on your readout is offset by 1.5 kHz from the center frequency. Table I shows what to dial up in USB mode in order to have the center of your signal in the right place.

ARRL Technical Relations Manager Paul Rinaldo, W4RI, suggests we make every effort to stay as close as possible to on-channel operation, never more than 50 Hz from the assigned carrier frequencies. With modern ham gear, staying on frequency may be easier than getting to exactly the right place to begin with. While tube-type "boat anchors" of yesteryear had a tendency to drift in frequency, today's phase-locked-loop (PLL) controlled radios are much more stable. "Most ham equipment, after about 10 minutes of warm-up, should easily hold within 10 to 20 Hz stability," comments Chip Margelli, K7JA, of Vertex Standard (Yaesu).

On the other hand, having the frequency on the readout match up precisely with the actual operating frequency may be a different story. Many radios may not be calibrated with-

Assigned Center Channel	Dialed USB Frequency
5332 kHz	5330.5 kHz USB
5348 kHz	5346.5 kHz USB
5368 kHz	5366.5 kHz USB
5373 kHz	5371.5 kHz USB
5405 kHz	5403.5 kHz USB (shared with UK)

Table I– Guide to correct tuning for USB operation on the five permitted 5 MHz frequencies, based on 1.5 kHz frequency offset from center for SSB operation. FCC-assigned center frequency is on the left; frequency that should show on your tuning dial is on the right.



Some radios, such as the ICOM 706 shown here, may be opened for transmit operation on 60 meters simply by removing a diode . . . BUT this surface-mount diode is one quarter the size of an ant! Don't try it unless you're quite experienced with surface-mount devices. AND removing this diode opens the radio to transmit across its full range, so you'll have to be extra careful to be sure you're on an authorized frequency and your signal is technically "clean."

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in 50 Hz of "on-frequency" when they are shipped in from overseas. According to one manufacturer, this is intentional, supposedly to compensate for the inevitable aging of the master crystal in the PLL oscillator circuit. Although a difference of 100 Hz is hardly detectable by most hams, a 60 meter operator who is 100 Hz off frequency probably will get the attention of spot-on operators on the new five channels.

Checking Readout Accuracy

It's easy to check how close you are to spot-on: Dial your transceiver in upper sideband to WWV at 5 MHz, getting your display to show as many zeroes as possible. Alternate between upper sideband and AM while listening to the WWV AM tone of 500 Hz or 600 Hz. You will notice that your VFO alters the apparent tone frequency, but AM gives you the actual tone you are looking for even though the dial may not be spot-on. Adjust the tuning ever so slightly until there's no difference in tones between AM and USB.

If you find that the dial shows 5.000.010 when the tones match up precisely on USB, it means that your radio is 10 Hz low, and you will either need to go into the radio and slightly adjust the PLL oscillator trimmer cap to calibrate it spot-on, or memorize each of the five channels in upper sideband, X.XXX.01. On radios that may read out to 1 Hz in the fine-tune mode, note the error offset to WWV when listening to the tones in both AM as well as upper sideband, and add or subtract that error offset to each of the five channels you plan to memorize in upper sideband (remember the additional offsets in Table I).

The reason I recommend storing these five channels in memory is to *prevent* any operation *outside* of the ultra-strict channel limits. This also includes watching your modulation peaks so they will not offer audio higher than 2800 Hz or lower than 200 Hz. This should keep total bandwidth to no more than 2.6 kHz. The rules permit 2.8 kHz, but virtually all the technical experts agree it's best to err on the conservative side and leave a little bit of room for error. This will keep NTIA concerns at a minimum. The National Telecommunication and Information Administration, which allocates frequencies for federal government users, is the agency most concerned about potential interference between amateurs and current government users of the band. (According to NTIA, some 15 federal agencies currently use the band, including the Coast Guard, the military, and the Justice Department.)

Transmitting on 5 MHz

How are you going to get your radio to transmit on this new band? Virtually all ham transceivers, as shipped from the factory, block out transmit on non-authorized general-coverage bands. Now that we *are* authorized five channels on 5 MHz, will simply cutting the secret diode open up this new band for us? Modification handbooks such as those from Artsci (www.artscipub.com) and mod websites such as www.mods.dk or the mod section of www.qrz.com will be popular places to go for do-it-yourselfers who are good at working on very tiny programming diodes or surface-mount chips. Some hamfests may be attended by mod doctors who probably will be doing a landslide business this fall!

However, will a 5 MHz mod produce spectrally clean output? That's where manufacturers are cautious when anyone asks whether present ham rigs may be simply modified to transmit on the new 5 MHz channels.

"All our incoming HF equipment is spectrally tuned out to all of the ham bands authorized for that equipment for sale in the United States. If a ham modifies his own equipment for an altogether different band that our equipment was not necessarily designed to transmit on, I would caution him to double check for the purity of his output on a spectrum analyzer," notes one manufacturer quizzed about 5 MHz operation at the recent Dayton Hamvention®. "It's a good question that everyone is asking, and the last thing we want would be a ham going into transmit alignment procedures without all of the expensive test equipment necessary to check for harmonics and spurious emissions," he adds.

CQ contacted many amateur equipment manufacturers about putting their radios on 60 meters. The information we gathered is in Table II, but there is quite a bit of concern among manufacturers about technical standards and how to best accommodate this tightly channelized band.

Company	Modifications to Transmit on 5 MHz
Alinco	No modifications planned for current HF radios.
Elecraft	Upgrade kit to be available soon.
ICOM	Upgrade plans not finalized at press time.
Kenwood	New HF+6 radio previewed at Dayton will come ready to operate on 60 meters; firmware upgrade possible for TS-2000; no current plans for other radios.
SGC	The SG-2020 is designed to be easily "unlocked" for MARS/CAP use; owners should contact SGC for instructions.
Ten-Tec	Downloadable "Flash Updates" to be available online (at www.rfsquared.com) for Orion, Argonaut V, Pegasus and Jupiter; no 60-meter mods planned for other models.
Yaesu	Upgrade plans not finalized at press time; technical issues need to be resolved with FCC.

Table II– Putting current gear on 60 meters. The information above is provided by representatives of the respective manufacturers. There is considerable concern about technical issues, including how to restrict 5 MHz operation to five narrow channels on an otherwise tunable radio. Many current models have MARS/CAP modifications available (either from manufacturer with proof of MARS/CAP authorization, or on the internet). However, these mods open the radios to transmit across the entire HF spectrum, and several manufacturers warn that users will need to be very careful not to transmit on unauthorized frequencies and to monitor spectral purity on frequencies for which the radios were not originally designed to transmit.

Calculating ERP

The new 5 MHz band has a restricted effective radiated power output of 50 watts. This is not the power coming out of the back of your rig, but the *effective* power coming out of your antenna, based on a combination of transmitter power, feedline losses, and antenna gain or loss. The FCC agrees that a halfwave dipole would be considered 0 dBd, so hams coming up on 5 MHz with their homebrew dipole need to closely monitor their output power at the shack at absolutely no more than 50 watts PEP, with a .5 dB fudge factor going into 100 feet of common RG-8/U coax cable. One hundred feet of small RG-58 cable at 5 MHz would have a loss of 1 dB, which equates to a decimal value of 0.794. If you divide 50 by 0.794, you get 62.9 watts PEP (rounded to the nearest tenth) allowed out of the back of your radio if you're using thin RG-58. However, many inexpensive wattmeters may have 5% accuracy variations, and inexpensive

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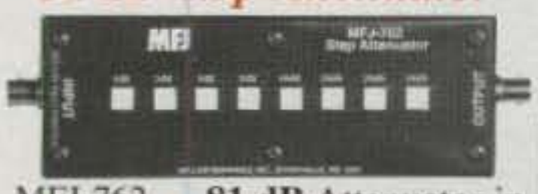
MFJ-801
$19.95

MFJ-801 has 1¾ inch meter, sensitivity control, 20 inch extended telescoping monopole antenna.

81 dB Step Attenuator



MFJ-762
$69.95

81 dB Attenuator in 1 dB steps. 50 Ohms. Usable to 500 MHz. 250 milliwatt maximum input. BNC connectors. Shielded stages. Connect between receiver and antenna and use S-meter as a precision calibrated field strength meter. Prevent receiver blocking, cross-modulation. Determine gain/loss, ideal for fox hunting. Evaluate linearity. Isolate circuits. Extend range of sensitive equipment. Measure input/output level differences.

MFJ Frequency Counters

MFJ-886
$119.95

MFJ-886 covers 1 MHz to 3 GHz with 300 MHz direct count, 0.1 Hz resolution. 4 gate times. 10-digit high-contrast 3/4 inch LCD display. Lock display button. Bargraph shows RF field strength. Includes rechargeable Ni-Cad batteries, charger, telescopic antenna. Black anodized aluminum. 2¾x2¼x1¼ in.

MFJ-888
$184.95

MFJ-888, like MFJ-886, but covers *10 Hz*-3 GHz. Measures frequency/period, has 50/1M Ohm input, auto hold, LED backlight, beeper. 2¾x4¼x1¼ in.

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You're ragchewing with a G3 in England . . . *"Temperature outside is a cool 53 degrees with falling barometric pressure -- looks like a rainstorm may be coming. Humidity here is 73%."* . . . while noticing it's 1900 hours GMT.

This informative MFJ Wireless Weather Station receives and displays outside temperatures from up to 3 remotes every 30 seconds up to 100 feet away.

You'll get barometric pressure trends, weather forecasting, severe storm detection with visual and audible alarms -- great for severe weather nets.

You can read inside and outside F/C degrees, relative humidity, forecast icons, pressure trend, hour, minutes, seconds, day, date and month *simultaneously*.

Has upper/lower temperature limit alarms, backlight. Read time in two zones -- local and GMT or other -- in 12/24 hour format.

Display (4x7x1") uses 2 AA, remote (2¼x3½x1") uses 2 AAA batteries, not included. *Includes one remote*, extra **MFJ-192S** remotes are $19.95 each.

MFJ CW Reader/Keyer

MFJ-464
$179.95

(Keyboard, paddle not included.)

Plug MFJ's CW Reader with *built-in* Keyer into your transceiver's phone jack and key jack. Now you're ready to compete with the world's best hi-speed CW operators -- and *they won't even know you just passed the code test!* Sends and reads 5-99 WPM. Automatic speed tracking. Large 2-line LCD shows send/receive messages. Use paddle or computer keyboard. Easy menu operation. Front panel speed, volume controls. 4 message memories, type ahead buffer, read again buffer, adjustable weight/sidetone, speaker. RFI proof.

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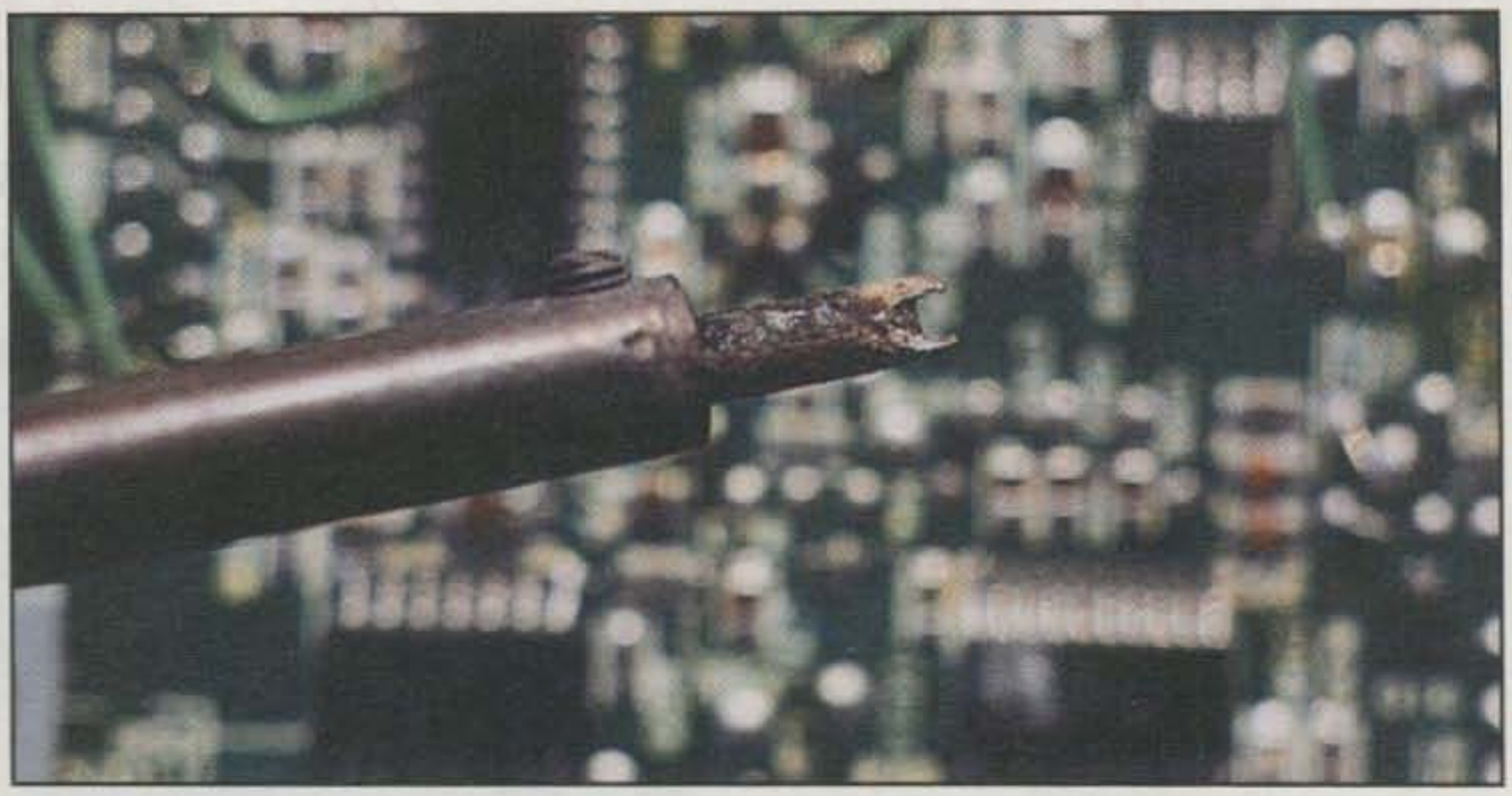

IF you're experienced in removing surface-mount components without ripping traces off circuit boards, and IF you understand that the specs of most amateur HF rigs on the market today are guaranteed only for the authorized ham bands at the time they were introduced, and IF you understand the need for extreme caution when transmitting with a radio that's not limited to the ham bands, THEN this modified soldering-iron tip will make for quick removal of surface-mount devices.

wattmeters may not faithfully show peak power output with normal modulation, so probably the best way to set your rig is on a dummy load with a short run of coax, using a sustained whistle in the mic or holding the word "fooouuurrr" and throttling back power to just below 50 watts. In other words, if you're going to operate on 5 MHz with a homebrew dipole antenna, cut your normal 100 watt HF transceiver power output by at least half.

Mobile operators using classic center-loaded HF whips on 5 MHz probably will find they are well within the 50 watts ERP rules when running 100 watts PEP into their antenna systems, which would hardly be 50% as efficient as a 0 dBd dipole. Even the big monster mobile whips, if conforming to the typical 13 foot bridge clearance restrictions, would be hard-pressed to get 50% efficiency vs. a dipole at 5 MHz.

The 60 Meter Dipole

The end-to-end length of a halfwave dipole at 5 MHz, specifically 5.373 MHz (approximately the center of the "band"), is 87 feet, 1 inch. The calculation is based on two formulas, starting with:

wavelength/2 = 492/f(MHz)

This is the formula for a dipole in free space, but the length of a real-life dipole with copper wire is calculated slightly shorter with the formula we should all remember from our license exams:

wavelength/2 = 468/f(MHz)

This takes into account the slight resistance of the copper and feedpoint

Publisher	Title
ARRL	ARRL's Wire Antenna Classics (Vols. 1 & 2)
ARRL	The ARRL Antenna Book
CQ	Ham Radio Anthology: Antennas 1968–1972; 1973–1975
CQ	Lew McCoy on Antennas (by the late Lew McCoy, W1ICP)
CQ	The W6SAI HF Antenna Handbook (by the late Bill Orr, W6SAI)
RSGB	Antenna Experimenter's Guide
RSGB	Antenna Toolkit 2 (by the late Joe Carr, K4IPV)
RSGB	Antenna Topics (by Pat Hawker, G3VA)
RSGB	HF Antenna Collection
RSGB	The Antenna File

Table III– Selected references that should help with designing antennas for 5 MHz. Look at designs for 80 and 40 meters, then calculate proper lengths for 60 meters. ARRL and CQ books are available from the individual publishers, respectively, and at many ham dealers. Radio Society of Great Britain (RSGB) books are available from both the ARRL and CQ.

connections, the proximity to ground, and the proximity to objects near the dipole. Therefore, for 5.373 MHz, 468 is divided by this frequency for an end-to-end length of 87.102177 feet. Next, multiply 12 times .102177 to change the decimal value to inches, and you end up with 87 feet 1 inch (a 1/4-wave mobile whip using the metal vehicle as a counterpoise would be more than 43 feet tall!). The 87 foot dipole—43 1/2 feet per side and fed in the center with the apex higher than the ends—should give some terrific 5 MHz DX results. I would expect that some DX contacts will have already been made on our fifth channel, 5403.5 USB, which is also available to hams in the United Kingdom.

Beyond the Dipole

If you promise to cut your power out by four times, down 6 dB, or no more than 12.5 watts out the back of your rig, you easily could design a minimum 5 dB forward gain dipole by adding a parasitic element either in front of or behind the dipole. Both arrangements yield approximately 5.5 dB gain using either a slightly shorter dipole as a director 0.1 wavelength in front of the driven dipole, or a slightly longer dipole 0.15 wavelength to the rear to act as a reflector.

Many amateurs who build their own wire beams prefer using the shorter parasitic element acting as a director (approximately 10 percent shorter than the calculated length for the driven dipole; in this case about 78 feet, 5 inches). This yields an amazing 26 dB front-to-back ratio, but the arrangement pulls down input resistance to around 20 ohms, so you'll need some sort of impedance matching.

This, though, is the fun of ham radio—experimenting with wire antennas or a pair of mobile antennas end to end to develop directivity and forward gain. Luckily, listening in on these frequencies now, we are not plagued on 7 MHz with the problems of competition with foreign broadcast stations. This means there is less concern about developing an antenna with deep nulls off the end.

Some good antenna books for constructing wire dipoles, inverted-Vees, and beams are available from both CQ and the ARRL. Of course, none of them specifically addresses 60 meters, so you'll have to do your own calculations on element length, etc. See Table III for a selection of recommended antenna references.

Operating Tips

Once your station is up and running on 60 meters, conduct your QSOs much like you would on any shared-channel band, such as channelized FM frequencies on 10, 6, or 2 meters. Of course, only upper sideband is allowed on these five channels, and unlike 10 meter FM channelized operation, FM operation on the five 5 MHz channels would be strictly prohibited. Same thing with data and even CW—for now, at least, only upper sideband will be allowed.

If we get a good start on these five new channels, we will gain more respect from NTIA, which controls hundreds of additional channels or frequencies that we might someday earn when they see the respect we have given to our new 5 MHz allocations. Therefore, don't key up until that magic hour (should this somehow reach your hands before July 3), and make every conversation a roundtable to give everyone a chance to get on and learn all about where 5 MHz signals may be propagated during the day and at night. (Hurray—no nighttime foreign broadcast!) Remember, we're *all* newcomers on this band. See you on 60! ■

"I'm From the Government..."

Amateurs operating on 60 meters always need to remember that our operation here is secondary to an assortment of federal government users, including, but not limited to, the Coast Guard and the military. If a government station comes up on your frequency and informs you that it is needed for government use, or that you are causing interference to government communications, you *must* yield the frequency until the government stations are finished with their work.

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Rotating towers, stacked Yagis . . . in my mind that was only the United States of America. That is not so any longer, not since my visit to Finland for the World Radiosport Team Championship (WRTC) 2002.

Dream Station(s) in Finland
A Visit with Martti Laine, OH2BH

BY JOHN DEVOLDERE,* ON4UN

Finland must be the radio amateur's dreamland in Europe, judging by the number of very tall rotating towers with antenna stacks that I saw in just a few days. Our OH friends need these monster antennas to compensate for living at 60 to 75 degrees north latitude, where the aurora can be beautiful but devastating to radio communications. However, even monster antennas will not open a band that is closed. During sunspot-maximum years avid DXers, and especially contesters, play their song in grand style. Great communications engineers build super stations, take advantage of the latest advances in technology, and use all their inventiveness to play the game of radio. Finland is Nokia-land, so they must know something about telecommunications!

During my one-week stay in Finland for WRTC 2002 I had the opportunity to visit the station—or should I say, *stations*—of Martti Laine, OH2BH. There are two QTHs and three shacks, in addition to two highly advanced locations on the Aland Islands (OHØB) and the Canary Islands (EA8BH).

Martti has a beautiful new home just outside Helsinki, in Espoo, on the Baltic coast, on what seems like approximately 5000 square meters (18,000 square feet) of land. The house is very stylish and is proof of the good taste of world traveler OH2BH and his charming XYL Leena, OH2BE. I have been told that in Finland there are more saunas than residences! In addition to an ultra-modern sauna inside their new home, the Laine family kept an original old sauna built in the garden on the Baltic shore. A 30 meter (100 foot) self-supporting tower is topped with a Cushcraft triband Yagi (model X9) plus an 8-element 6 meter Yagi. Martti worked 75 countries and 38 states on 6 meters in just a few months!

The shack is like the rest of his house—a joy to the eye. A beautiful console houses all the equipment (all Yaesu) as well as an ACOM 2000 amplifier. The walls of the radio room (the word *shack* does not seem to fit the décor) are covered with CQ contest plaques. I counted about 50!

Most hams would find this a dream QTH. It is, but maybe it lacks something when it comes to grand-style contesting, as there isn't really enough room for high-performance low-

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The home of Martti, OH2BH, in Espoo (a suburb of Helsinki), located on the Baltic coast. (Photos by the author unless otherwise noted.)

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
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SS-30M*	25	30	3¾ x 7 x 9⅜	5.0

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SRM-25	20	25	3½ x 19 x 9⅜	6.5
SRM-30	25	30	3½ x 19 x 9⅜	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅜	6.5
SRM-30M	25	30	3½ x 19 x 9⅜	7.0

MODEL SRM-30M-2

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MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30-2	25	30	3½ x 19 x 9⅜	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅜	11.0

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SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

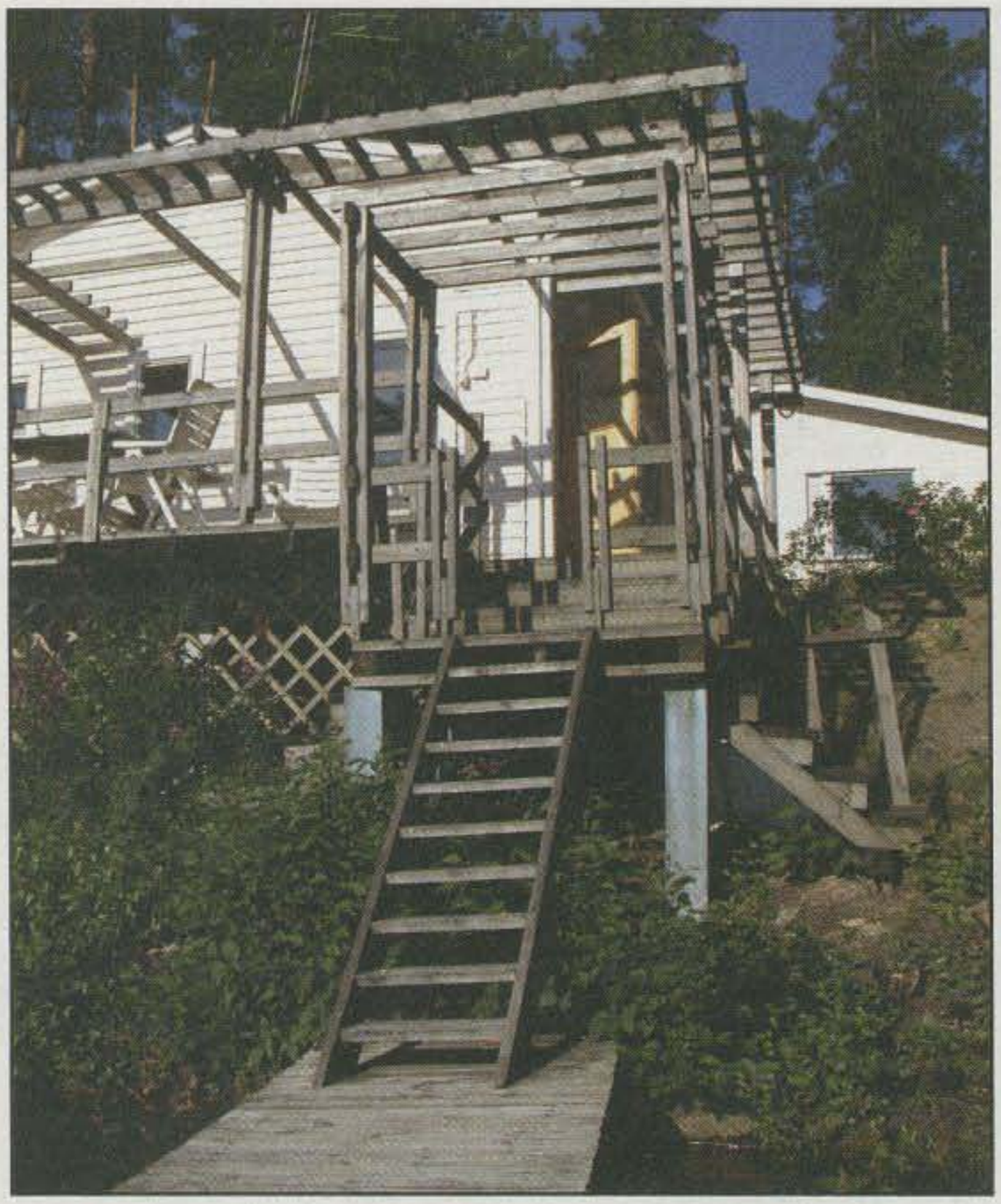
*ICS – Intermittent Communication Service

band antennas. Even in Finland, I guess it would be asking too much to be able to erect more than one 30 meter tower in the middle of a high-class residential area.

The Contest QTH

I guess that's what made Martti look for a "real contest QTH," which he found some 75 kilometers (45 miles) northwest of Helsinki, in Pusula. Of course, it is on a lakeside site. I have to admit it must be hard to find a QTH in Finland that is not near a lake. After all, Finland is the land of 180,000 lakes.

The author, John, ON4UN (left), and Martti, OH2BH, in Martti's shack in his home in Espoo.



The lakeside OH2BH summer cottage. The shack in the cottage is a sound-proof audio-room. The FT1000D can drive the container shack in the same way as the Espoo QTH via an ISDN telephone line.

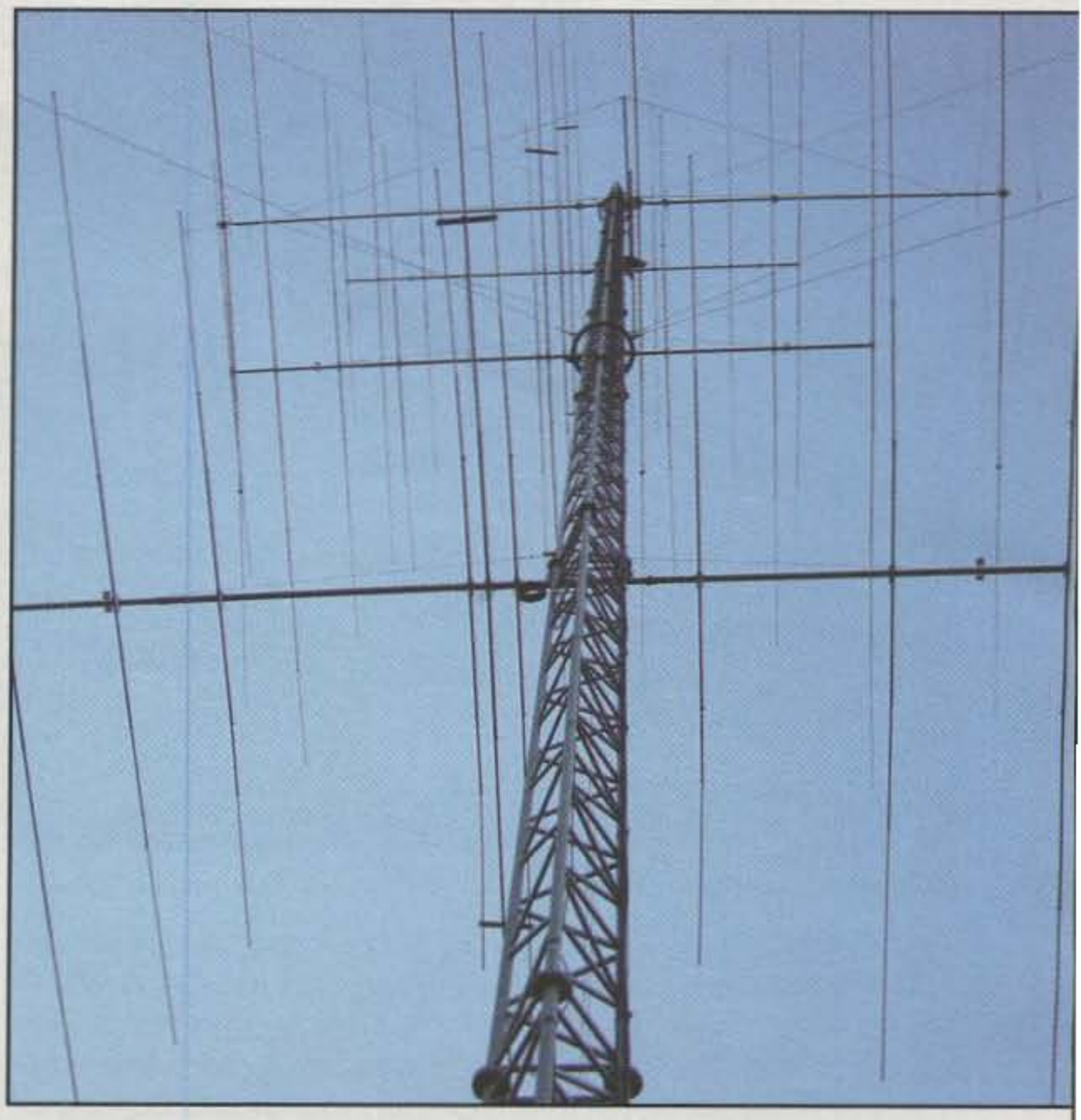
The last few kilometers of the drive to Martti's contest QTH take you on an unpaved road through a heavily wooded area. There are no houses, and it is just like the wilderness. Then out of the blue come high-voltage power lines, terminating into what looks like a 50 KW pole-pig transformer (you need a lot for heating the saunas!). That's the input power to the contest station. When I saw that, I knew we must be close to the site. Looking at the transformer sitting on a two-legged pole, my eyes quickly turned toward one of the output devices of the station—an impressive-looking 3-element 80 meter Yagi at a height of 48 meters (160 feet). What a sight!

Fifty meters (165 feet) beyond the pole pig is a "container shack" called Terasparma. This windowed container can be used as a contest shack, housing all the equipment. A large number of 7/8 inch hardlines run from the container to various antennas. However, this is not the only place from which the contest antennas can be operated. A mere 100 meters (330 feet) down the hill from the container shack, right on the lake, is Martti's summer cottage. The cottage has a small shack equipped with an FT1000D. A remote-control system in the cottage allows Martti to operate the amplifier and the antenna rotators located in the container shack up the hill.

Three rotating towers are set up in a triangle measuring approximately 50 meters on each side. A catenary nylon rope

The container shack on top of the hill, making the cable lengths equal from all three towers. The OH2BH station preferred contesting method is via a team (Formula One) configuration, with the most suitable operator "racing" and the support team taking care of the rest. For the team, the total package is what counts. (Photo from OH2BH contest QSL)

The chain-driven rotator system using a worm-gear drive. The box contains step-up and step-down electronics for smooth rotation.



The 48 meter (160 foot) tall tower with a 3-element Yagi for 80 meters and three stacked 10-element tribanders for 10/15/20 meters. (Photo by Toni, OH2JTE)

that runs between two of the towers supports a 3-element 80 meter quad-loop array pointing toward the U.S. (long and short path). Martti told me that now that the 80 meter Yagi is up, this antenna will be taken down, the 3-element Yagi being a better performer all the time. In the future he will use the support line to hang some phased-array verticals for 160 meters.

The 48 meter tower is the tallest of the towers and supports the 3-element 80 meter Yagi at the top. The tower is also loaded with three triband Yagis, each on a 7.5 meter (25 foot) long boom (three elements on 20 and 15, and four elements on 10) of local manufacture (Finnish Antenna Ltd., a company run by OH1JT and OH2HE). The stacking distance between these Yagis is 10 meters (33 feet), putting them at heights of 25, 35, and 45 meters (82, 115, and 148 feet, respectively). WXØB's StackMatch is used for the antenna selection.

The 80 meter antenna is a substantially rebuilt M^2 model 80M3. The linear loading was replaced with W6ANR coils, making it an exact copy of those used at W6KW, W6RJ, and K7ZV, not by coincidence the biggest signals from the west coast of the U.S. on 80 meters. To withstand the severe Finnish winters, extensive side and vertical Phyllistran® trussing was applied to both the elements and the boom. In order to make the Yagi operate at both ends of the band (SSB and CW), loading coils, also provided by W6ANR, are switched in the center of each element. At the contest QTH itself, because of all the trees there was not enough open space to assemble this 80 meter monster. Therefore, it was decided to do the assembly in an open field a few kilometers away. A helicopter was used to lift the antenna to the top of the 48 meter tower. The job was done in record time!

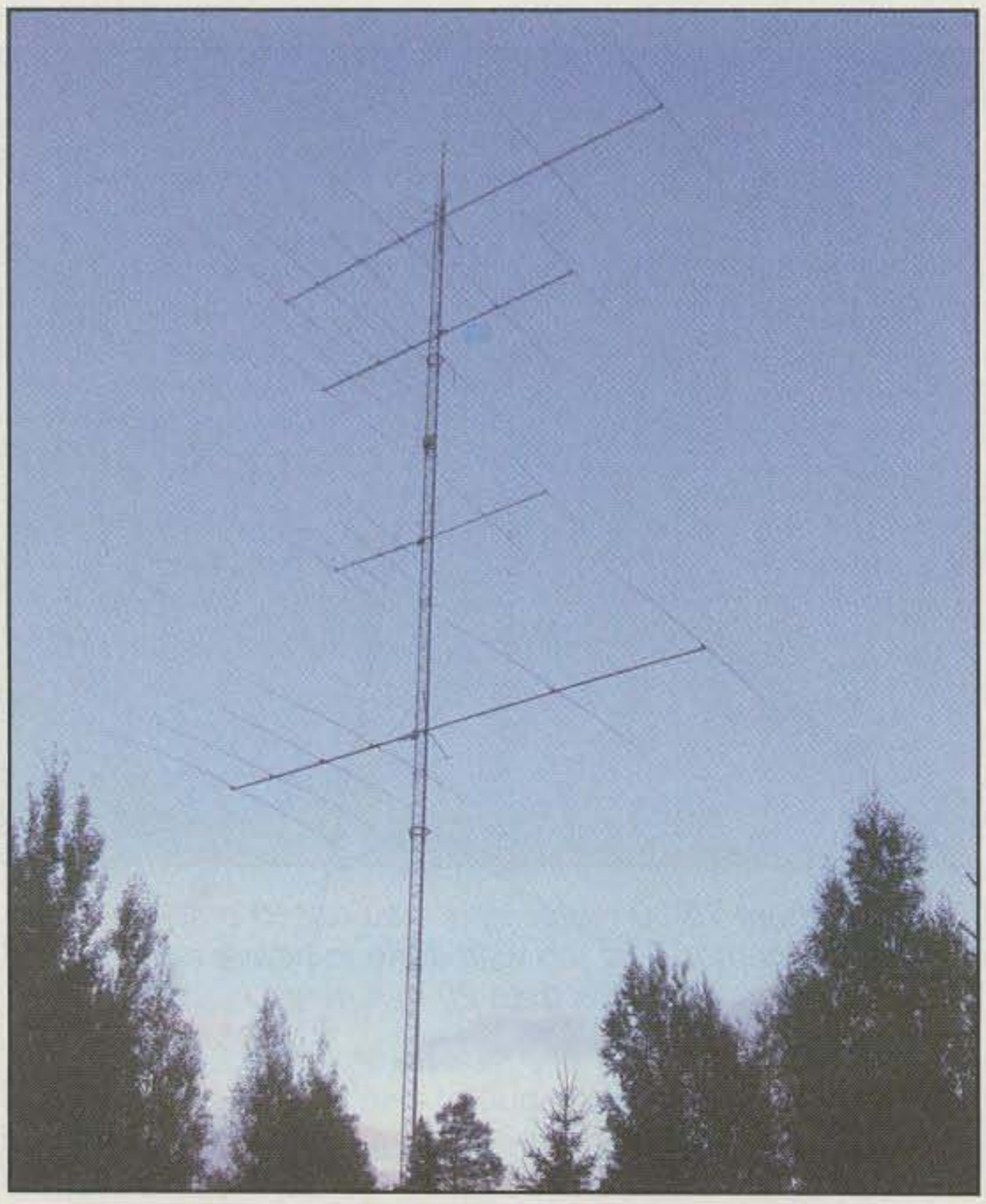
A second tower is 42 meters (140 feet) tall and supports stacked 20 meter Yagis, one at 42 meters and one at 24 meters (80 feet). In between these antennas are 10 meter (at 30 meters [100 feet]) and 15 meter (at 36 meters [120 feet]) Yagis. All of these Yagis are 6-element KLM Big Sticks. The pipe on the very top holds the end of a support rope to another tower with the 2-element 160 meter wire beam pointing to the U.S.

The 3-element 75/80 meter Yagi was raised onto the tower using a helicopter. The job was done in heavy rain, but still in less than 20 minutes!

The third tower (see title photo) also stands 42 meters tall, and it supports a 3-element, wide-spaced 40 meter Yagi at 36 meters, in addition to another three 4-element monoband Yagis for 20, 10, and 15 meters at 42, 30, and 26 meters (140, 100, and 90 feet), respectively.

Why is Martti using three towers? He wants to have three independently rotatable sets of antennas for the higher

The contest station includes a pair of Yaesu FT-1000 MP Mark V transceivers which are connected to a WXØB SO2R controller. Three towers support numerous antenna arrays, and band decoders control the antenna switching. A PC running TR Log connects it all together so that band changes are made instantly via the keyboard. OH2BH's station is built for contest efficiency! (Photo by Toni, OH2JTE)



Another 42 meter tower has a 6-over-6 KLM Big Stick for 20 meters, a 6-element Big Stick for 15/10 meters, plus 80 and 40 meter dipoles and a 2-element wire beam for 160 meters fixed on the U.S. (Photo by Toni, OH2JTE)

bands. He can also split the power into different sets of antennas to cover different directions at the same time. In a SO2R (Single Operator, Two Radios) configuration any of the towers can be used independently, or power can be split for radio A and radio B. The switching arrangement is such that two radios can receive on the same band using the same or different antennas. The entire switching system is foolproof, so it is impossible to transmit on the wrong antenna or blow up a receiver.

All the places I visited have the same type of Finnish-made rotating towers. They are manufactured by OH8QD, who has installed 200 such towers. OH8QD also makes his own tick rings.

Utilizing Locations and Technology

When Martti or his friends run a contest in Pusula, they use the Terasparma container as a shack for complete privacy. However, OH2BH can also control all the equipment from his little shack in the lakeside cottage, as well as from his home QTH some 75 kilometers away. The entire system is remote-controllable (all transceiver functions, rotator controls, antenna switching, and amplifier control). The amplifier is Finnish-made (by FinnFet, OH1MA/OH1RY). The control is done over an ISDN telephone line, using duplex audio (receive and transmit), while the second channel is dedicated to control functions. Martti got some tips from W6RJ, who uses a similar setup in California. The system uses a Kachina 505ARX I/O box, which allows full rotator control and has six general-purpose ports to switch among different functions or devices. The remote-control system is built around commercially available building blocks, but uses an extensive hardware/software design custom-developed by OH2LAK and OH3QK, two datacom and system-automation specialists.

Remote control is based on PC software that allows serial ports to be cloned over a TCP/IP connection that is made between the computers in Pusula and in Espoo. The radio-control software and Kachina rotor software in Espoo ordinarily run to a local virtual serial port which is cloned to Pusula over the ISDN TCP/IP connection and where the actual radio and remote-control boxes are connected to the computer. Software used to do this serial-port cloning is called Dialout/Server and is from Tactical software. Audio is transmitted over an analog ISDN channel to eliminate coding delay, which always occurs if operating through internet phone software or similar. In analog conversation there simply is no delay and the audio quality is better. Moving to internet audio is probably the next step, and then the remote station really will be remote-controllable from anywhere.

The remote station has PTT and CW keying capabilities with in-band signaling. PTT is delivered over the phone line as CTCSS tone and CW keying as 1 kHz tone, which is detected on the remote site.

It certainly looks as if Martti has almost everything under control, resulting in probably one of the best-engineered and best-equipped contest stations in Europe. It's too bad he cannot control propagation while working the world from a latitude the same as that of Anchorage, Alaska. However, it still provides Martti with an ultimate radio challenge.

My thanks to Martti, OH2BH, for giving me "the grand tour."

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Results of the 2002 CQ WW DX SSB Contest

BY BOB COX,* K3EST

Everyone was anticipating the big event, the 2002 CQ WW SSB Contest. Thousands of contesters had spent time building up their stations to meet the challenge. Countless phone calls, e-mails, and meetings with contesting as the topic had taken place among friends from Macao, to Argentina, to Germany, to. . . . Contesters have a bond and never tire of talking about, planning, and building their contesting skills and stations. If you want to have a great time and work exotic countries, join a contesting team or set personal goals you can strive to achieve.

The 2002 contest was a challenge in many ways. Countries, countries everywhere, and not enough time! Conditions covered the whole gamut. They were great, to average, to poor, depending on the day and where you were on the planet. Multiple auroras in the northern latitudes made life tough. Gale-strength storms throughout western and central zone 14 made just staying on the air a challenge. Propagation Friday was outstanding, and then a solar event reduced conditions until Sunday, when the bands were hopping again. From the number of entrants, it is apparent that everyone rode the roller coaster and enjoyed themselves. The CQ WW always brings out the best in contesters. There were great efforts from all corners of the world.

High Power

A North American station took top honors again in the CQ WW SSB! Jeff, N5TJ, operating with the call KP3Z, made a fantastic score of 15.6 million points, thus setting a new North American record! Finishing in second place was Jim, W7EJ, who traveled to CN2R. QSOs came more easily there than at 9M8R, his usual abode. Third place in the world went to Jose, CT1BOH, operating at PTØF. All three operators provide examples for contesters to model themselves after: willingness to travel to put their skills to the maximum challenge, detailed planning of the whole contest, the flexibility to change with changing conditions, and very high motivation.

In Europe Chris, GM3WOJ, traveled to the Isle of Man, where he found conditions to his liking. He talked GD6IA to the top score in Europe. Second place went to GM7V operated by Keith, GM4YXI. Both top scorers are members of the North of Scotland Contest Group. In third place was SN7Q operated by Chris, SP7GIQ.

In the U.S. Bob, KQ2M, did his usual fine job. His station has been built up to a high level. More QSOs and mults always lead to a big score. Second place went to Ken, K4ZW, who has steadily moved up the top ten list. A great job from northern Virginia. Third place went to Pat, N9RV, who also did a great job in his station's real maiden voyage from northern Indiana. The competition in the 9th call area was fierce with N9RV, W9RE, and WB9Z fighting it out. The number one score from out west was Dean, N6BV, with K5RR/7 coming in second.

Continental leaders were KP3Z (NA), CN2R (AF), 9K9X (AS), GD6IA (EU), VK5GN (OC), and PTØF (SA).

Low Power

The number one 100W or less entrant in the world was Alberto, IV3TAN, operating D44TD. This was a new world record. Second place world went to Didier, FY5FY, and third place went to John, W2GD, operating P40W.

In the U.S. there were seven scores over 1 million! In this hotly contested category the top spot went to Les, N1SV. You had to turn your beam west to find second place, Terry, N4TZ/9, and third place, Marv, N5AW. The top score from the far west was made by Tom, N6NF, followed by Bill, ACØW.

In the very competitive atmosphere of Europe, the top honor was taken by Andrius, LY2TA, at LY7Z from the northeastern tip of Europe. Second place went to Manuel, EA7RM, operating at the southwestern tip. Third place went to Zlatko, 9A2EU. All three turned in top-notch scores. Other very notable scorers were 6W/F6HLC, ZX2B, 9G5MD, and CN8NK.

Continental leaders were 6Y9X (NA), D44TD (AF), JT1BV (AS), LY7Z (EU), KH6/NØHJZ (OC), and FY5FY (SA).

QRP

Entering the QRP category calls upon the entrant to perfect his or her contesting skills. Searching for QSOs, timing calling CQ, and knowing when to give up and go search and pounce all are factors. For the first time in a long time, the first three QRP world winners were from Europe. What a fight for the top positions! The number one world QRPer was Gerard, F5BEG, followed by SP3KEY (SP3DWQ) and Bosko, YT7TY. All three broke the 1000 Q mark, but only F5BEG broke the 1 Meg barrier.

The KH7R Multi-Multi team (left to right): KH6ND, KL7Y, KH7U, WL7E, AH6OZ, K9PG, WA2GO, and K9NW. Sadly, KL7Y became a Silent Key less than a week after the contest.

First place in the U.S. went to Tom, N4KG. What a great job he did. A very FB second-place effort was turned in by Rev, NØKE, way out in Vail, Colorado. Third place U.S. went to Larry, N5FPW/4. The top West Coast scorer was Jim, W6YJ, followed by Alan, W6RCL.

Special mention should be made of JR4DAH and JA1YNE, who submitted the top scores in Asia. The single band efforts of TT8ZZ, EA2CAR, UN4L, LR7E, KP4KE, KR2Q, 6D2X,

Expanded CQ WW Contest Results on the Web

We've moved a few elements of our contest reporting onto the CQ website again this year, including **Station Operators** of Multi-Op stations, **Team Contesting**, **Top Scores in Very Active Zones**, and **Zone Leaders/Single Op**. In addition, we have expanded **QRM** on the web.

To view these additional and expanded elements of the 2002 CQ WW SSB results, go to <http://www.cq-amateur-radio.com/cqwwhome.html>, then click on "Expanded Results, 2002 CQ WW SSB" and select the category you want to see. You may also get there by going to our home page at <http://www.cq-amateur-radio.com>, clicking on "Contest Rules & Info," then clicking on "CQ World Wide DX Contest" and selecting "Expanded Results, 2002 CQ WW SSB."

*e-mail: <k3est@cqww.com>

TROPHY WINNERS AND DONORS

SINGLE OPERATOR
World All Band
KP3Z (Opr. Jeff Steinman, N5TJ)
Donor: Dave Rosen, K2GM
WA2RAU & W2SKE Memorial

World Low Power
D44TD (Opr. Alberto Annesi, IV3TAN)
Donor: Slovenian Contest Club

World QRP
Gerard Gendron, F5BEG
Donor: Doc Sayre, W7EW

World Assisted
P40P (Opr. Robert Wood, W5AJ)
Donor: CTRI Contest Group

U.S.A
Robert Shohet, KQ2M
Donor: Potomac Valley R.C. – KC8C Memorial

U.S.A. Low Power
Les Peters, N1SV
Donor: North Coast Contesters

U.S.A. Zone 3
Dean Straw, N6BV
Donor: Dave Pruett, K8CC & Greg Surma, K8GL

U.S.A. Zone 4
Pat Barkey, N9RV
Donor: Dave Pruett, K8CC & Greg Surma, K8GL

Canada
John Sluymer, VE3EJ
Donor: Niagara Frontier Int'l DX Assn.
VE3WT Memorial

Caribbean/C.A.
FS/AH8DX (Opr. Craig Maxey, AH8DX)
Donor: Alex M. Kasevich, VP2MM

Europe
GD6IA (Opr. Chris Tan, GM3WOJ)
Donor: Potomac Valley R.C.
W4BVV Memorial

Europe Low Power
LY7Z (Opr. Andrius Ignotas, LY2TA)
Donor: Scott Jones, N3RA & Tim Duffy, K3LR

Russia
RM4W (Opr. Sandy Orlov, RW4WR)
Donor: Roman Thomas, RZ3AA

Africa
CN2R (Opr. Jim Sullivan, W7EJ)
Donor: Gordon Marshall, W6RR

Asia
9K9X (Opr. Hamad Al-Nusif, 9K2HN)
Donor: 2 AM Dayton Pizza Gang

Japan
Masaki Okano, JH4UYB
Donor: Japan Crazy Contesters Club

Japan Low Power
Masaru Takahashi, JS1OYN
Donor: Western Washington DX Club

Oceania
Martin Luther, VK5GN
Donor: Northern California DX Club

South America
PT0F
(Opr. Jose Carlos Cardoso Nines, CT1BOH)
Donor: Yankee Clipper Contest Club

South America – Mainland
Didier Bironneau, FY5FY
Donor: Radio Club Paraguayo

SINGLE OPERATOR, SINGLE BAND
World – 28 MHz
TY0T (Opr. Pasquale Speranza, I8QLS)
Donor: Joel Chalmers, KG6DX

World – 21 MHz
TY3M (Opr. Pier Iovino, W1NA)
Donor: Robert Naumann, N5NJ

World – 14 MHz
IG9A (Opr. Fabio Grisafi, IT9GSF)
Donor: North Jersey DX Assn. – K2HLB Memorial

World – 7 MHz
9Y4TBG (Opr. Andreas Kretzschmar, DL4MEH)
Donor: Fred Laun, K3ZO – K7ZZ Memorial

World – 3.7 MHz
IG9V (Opr. Marco Pimpolari, IK0YVV)
Donor: Fred Capossela, K6SSS

World – 1.8 MHz
C4A (Opr. Ivo Pezer, 5B4ADA)
Donor: Robert Wruble, W7GG

USA – 28 MHz
Bill Tippett, W4ZV
Donor: Donald Thomas, N6DT

USA – 21 MHz
William Johnson, KV0Q
Donor: Worldradio

USA – 14 MHz
Daniel Handa, W7WA
Donor: Southern California DX Club

USA – 7 MHz
Bill Kollenbaum, K4XS
Donor: Stanley Cohen, W8QDQ

USA – 3.7 MHz
Theodore Demopoulos, KT1V
Donor: CQ Magazine

USA – 1.8 MHz
Ronald McClain, W2VO
Donor: CQ Magazine

Carib./C.A. (21 MHz)
KP2A (Opr. Robert Hayes, KW8N)
Donor: CQ Magazine

Europe – 28 MHz
Emil Balen, 9A9A
Donor: Worldradio

Europe – 21 MHz
TM9R (Opr. Michel Rousselet, F5FNL)
Donor: Tine Brajnik, S50A

Europe – 14 MHz
Petar Milicic, 9A6A
Donor: A.G. Anderson, GM3BCL

Europe – 7 MHz
Tine Brajnik, S50A
Donor: Roger Burt, N4ZC

Europe – 3.7 MHz
OE6Z (Opr. Michael Schwab, OE6MBG)
Donor: Marconi Contest Club – I3MAU Memorial

Europe – 1.8 MHz
Bojan Sever, S57M
Donor: Robert Kasca, S53R

Oceania (28 MHz)
Stanley Tomyl, AH6JR
Donor: Bruce D. Lee, KD6WW

Japan – 21 MHz
Satoshi Hara, JH5FXP
Donor: DX Family Foundation

Japan – 14 MHz
Kenji Sharyo, JI3BFC
Donor: Take Yokoyama, JL1BLW

MULTI-OPERATOR, SINGLE TRANSMITTER

World
HC8A (Oprs: W6NL, K6BL, XE1KK, N5KO)
Donor: So. Calif. DX Club – W6AM Memorial

U.S.A.
N4PN (Oprs: N4PN, NF4A, N4OX, KB4ET)
Donor: Carolina DX Association

Carib./C.A.
8P8P (Oprs: NT1N, W1UK, WC1M, W2SC)
Donor: Eric Scace, K3NA

Africa
EA8ZS (Oprs: EA8ZS, EA4DX, OH0XX, OH1MA, OH1RY, OH2BH, OH2MM, OH2JTE, OH2PM, OH2TA)
Donor: CQ Magazine

Asia
P3A (Oprs: RA9JX, RZ9UA, RZ3TX, RA0AM, RW9UP, UA9UR, RV9UP, UA9CDV)
Donor: Edward L. Campbell, NT4TT

Japan
JA7YAA (Oprs: JE7HLZ, JG7PSJ, JO7DJT, JO7FTJ, JI5RPT)
Donor: Vienna Int'l ARC – 4U1VIC

Europe
TM5C (Oprs: F5VCO, F5LND, F5NLY, F6ARC, F6CTT, 5B4WN)
Donor: Bob Cox, K3EST

Oceania
KH0AA (Oprs: JF1SQC, JP1NWZ, JE1JKL)
Donor: Junichi Tanaka, JH4RHF

South America – 2nd Place
LR0N (Oprs.)
Donor: Victor Burns, KI6IM

MULTI-OPERATOR, TWO TRANSMITTERS
World
PJ2T (Oprs: WC4E, K1AR, K8NZ, W1MD, N8BJQ)
Donor: Ranko Boca, YT6A

U.S.A.
N3RS (Oprs. N3RS, N3RD, N3ED, N2SR, W8FJ, WA3LRO)
Donor: Kimo Chun, KH7U
Dan Robbins, KL7Y Memorial

MULTI-OPERATOR, MULTI-TRANSMITTER
World
IH9P (Oprs: DF4OR, JA3USA, K3PN, OL5Y, I2IFT, IK2ANI, IK2CIO, IK2HKT, IK2RZP, IK2SND, IK2YCN, IK7JWY, IK8ETA, IN3QBR, IN3SAU, IN3ZNR, IT9BLB, IT9WPO, IT9ZGY, IT9ZMX, SWL Matteo)
Donor: Dave, W6NL & Barb, K6BL Leeson

U.S.A.
KC1XX (Oprs: KC1XX, AD1C, HC1OT, K1DG, K1GQ, W1FV, KM3T, K6AW, N6HB, N6IG)
Donor: Paul Hellenberg, K4JA

Europe
DF0HQ (Oprs:DK4WA, DL1AUZ, DL2SAX, DL3DXX, DL3TD, DL4ALB, DL5AOJ, DL5ANT, DL5AXX, DL5LYM, DL5YY, DL7VOA)
Donor: Finnish Amateur Radio League

Japan
JA3YBK (Oprs: JH3PRR, JG3KIV, JI3OPA, JH4IFF, JH4NMT, JR4ISF, JF4FUF, K9XW)
Donor: Ryozo Goto, JH3JYS

CONTEST EXPEDITIONS
World Single Operator
TO5A (Opr: Al Crespo, NH7A)
Donor: National Capital DX Assn.
Stuart Meyer, W2GHK Memorial

World Multi-Single
VP5B (Oprs. K4ISV, K4BBN, N4YBG, K4CN)
Donor: Dieter Loffler, DK9KD
European DX Foundation

World Multi-Multi
XX9C (Ops: XX9BB, VR2BBC, VR2ZST, VR2MK, VR2MY, VR2KW, BA7IA, BD7IB, BG7IEE, BA7JA, BA7JG, BD7NI, BA7NQ)
Donor: Tachio Yuasa, JA9VDA

SPECIAL SINGLE OPERATOR AWARD
World-All Band Under 21 years old
Hamilton Oliveira Martins, PX2W
Donor: Gene Zimmerman, W3ZZ

EA4DQD, JL7BRH, RW3VZ, and YU1RA were outstanding.

Continental leaders were N4KG (NA), JR4DAH (AS), F5BEG (EU), VK3VP (OC), and AY5FZ (SA).

Assisted

Operating in the Asssisted category takes discipline. You have to make the best use of it without giving up your QSO total. It's not easy to do. All the top Assisted ops have mastered the balancing act.

Taking the top place in the world and setting a new world record was Robert, W5AJ, operating at P40P. Second place went to Al, 4L5A, at D4B, who operated from a mountaintop. Serge, MØSDX, traveled over to GIØKOW and took European honors as GI5W. What a fine job. Just to stay on the air in zone 14 during hurricane-like weather was a challenge. Second place in Europe went to Ben, DL6FBL, and third place to Stanko, S50S.

In the U.S. the battle for the top spot was fierce. First place went to Ray, W2RE, followed by Charlie, K3WW, and Noah, K2NG.

Continental leaders were W2RE (NA), D4B (AF), JY9QJ (AS), GI5W (EU), KH6/K1ER (OC), and P40P (SA).

Multi-Single

A real battle occurred in the Multi-Single category. Three FB stations with top operators went head to head. The winner was the team from the Galapagos, HC8A. Located due south of New Oreleans, they sure were heard everywhere. Across the Atlantic, EA8ZS, manned by seasoned contesters, finished second. Third

TOP SCORES

WORLD
High Power
All Band

KP3Z	15,655,517
CN2R	14,220,891
PTØF	12,796,580
3V8BB	11,110,708
P4ØB	9,630,495
9K9X	9,194,824
FS/AH8DX	8,646,482
VE3EJ	8,498,500
VY2ZM	8,206,100
KQ2M/1	7,152,781

28 MHz

TYØT	2,418,341
CX5BW	1,687,442
9A9A	1,598,832
9K2ZZ	1,590,075
ZY5G	1,508,940
ZS6WPX	1,434,680

21 MHz

TY3M	2,332,568
ZX5J	2,236,500
KP2A	1,795,425
H22H	1,592,981
9S1X	1,498,350
JH5FXP	1,300,065

14 MHz

IG9A	2,235,534
P40A	2,129,650
9Y4NZ	1,568,583
9A6A	1,105,808
OK1RI	1,098,240
ZS6Z	1,079,760

7 MHz

9Y4TBG	912,950
EA9LZ	717,831
S50A	574,896
9A5E	470,960
YT7A	418,264
LY5A	404,337

3.7 MHz

IG9V	261,423
OE6Z	192,170
YTØA	189,244
OMØC	184,140
S54E	174,570
EI8IR	159,965

1.8 MHz

C4A	95,140
S57M	77,784
OZ3SK	56,092
EU6EU	49,876
4O6A	49,476
LY2HM	42,813

Low Power
All Band

D44TD	11,199,793
FY5FY	8,508,468
P4ØW	6,670,839
6W/F6HLC	4,904,544
ZX2B	3,391,158
LY7Z	3,278,436
EA7RM	3,229,525
9G5MD	2,661,100
9A2EU	2,531,504
CN8NK	2,436,591

28 MHz

PJ4/OH1VR	1,248,528
AY4DX	1,162,842
HC1JQ	1,187,460
EA8TX	1,106,481
LU3HIP	925,141
LV7H	917,205

21 MHz

VE3DZ	508,375
CX7BY	411,680
L44DX	409,386
OK1TN	361,916
EA7HBP	352,728
W6AFA	307,784

14 MHz

YU7ZZ	388,512
HP1BYS	332,905
RK9AWC	317,756
UN9LN	294,224
EA3GHZ	293,058
UN7JX	258,279

7 MHz

UA9AYA	192,786
EU1AZ	51,429
UZ5U	49,868
SM6DOI	40,020
VK4UC	38,934
PA1TT	38,335

3.7 MHz

T94YT	80,238
DH6LS	56,050
4NØB	41,144
OK2HI	39,120
OK1FPS	36,660
LY2OW	35,428

1.8 MHz

TA3J	58,410
HA8BE	40,460
S5ØO	38,304
LY3UM	28,050
SP4ZO	25,380
G3UEG	24,366

QRP, All Band

F5BEG	1,158,573
SP3KEY	963,795
YT7TY	925,010
N4KG	625,488
JR4DAH	567,948
JA1YNE	437,570
NØKE	427,305
IK5RUN	360,914
DF1DX	304,720
UA9AMF	295,380

Assisted, All Band

P4ØP	12,975,732
D4B	11,567,412
GI5W	7,364,135
JY9QJ	6,929,280
W2RE	5,921,160
K3WW	5,524,008
DL6FBL	5,409,850
S5ØS	5,372,406
K2NG	4,732,595
OE1A	4,625,844

Multi-Op, Single Trans

HC8A	22,511,664
EA8ZS	20,869,812
8P8P	20,065,950
P3A	19,647,550
TM5C	12,661,826
KHØAA	12,599,064

Multi-Op, Two Trans

PJ2T	28,415,835
ZD8Z	24,897,950
CT9L	22,064,112
V26B	18,756,933
ZW5B	16,201,515
RW2F	14,163,303

Multi-Op, Multi-Trans

IH9P	49,469,160
A61AJ	33,377,700

CQ9K	31,004,311
KH7R	28,795,122
YV4A	25,461,886
KC1XX	19,390,428

USA
High Power
All Band

KQ2M/1	7,152,781
K4ZW	6,168,400
N9RV	5,638,400
K5ZD/1	5,280,044
K3ZO	5,276,637
W9RE	4,769,154
WB9Z	4,386,756
W2WB	4,170,965
W3BGN	4,155,347
K3CR	3,847,584

28 MHz

W4ZV	1,027,900
K5RX	950,274
W5PR	888,960
K4WI	850,500
N4BP	685,562
K7KR	275,184

21 MHz

KVØQ	633,476
N3HBX	549,180
W7UT	539,460
W5TM	484,330
K4VUD	347,400
WA2C/3	303,600

14 MHz

W7WA	725,420
N7DD	366,405
W7EB	181,200
WY3T	144,596
KR6NA/Ø	104,604
K9CAN	94,381

7 MHz

K4XS	291,942
WQ2M	79,910
N8PR/4	57,938
K7XZ	47,124
W9SE	30,096
K1EY/4	26,746

3.7 MHz

KT1V	144,584
AA1BU	131,712
AA4MM	17,040
KØGT	13,200
W5FO	12,600

1.8 MHz

W2VO	1,736
N8LIQ	360

Low Power
All Band

N1SV	1,815,696
N4TZ/9	1,743,126
N5AW	1,679,288
NR3X/4	1,567,718
W1CTN	1,406,529
WB2ZTH	1,286,168
N4IG	1,245,335
K1HT	1,221,090
WS1A	1,219,910
W1KT	1,212,848

28 MHz

N5XJ	283,986
K2MFY	270,907
W8LU	257,232
NX5N	225,760
W7UPF	200,504
KY5N	193,575

21 MHz

W6AFA	307,784
WØAH	243,162
N4MO	235,221
AG9S	186,202
KX9X	167,850
W1EL	141,372

14 MHz

K3SWZ	111,244
W4LC	89,027
K2RED	75,936
KA2JEM	75,438
KX2S	49,920
KG1V	38,315

7 MHz

K2UF	25,315
*KU1CW/Ø	22,596
N2KX	21,951
K2YEH	19,295
KAØCT	2,726
NØHF	1,290

3.7 MHz

KC5LK	1,980

1.8 MHz

W2MF	1,856

QRP, All Band

N4KG	625,488
NØKE	427,305
N5FPW/4	210,330
K8ZT	205,680
N8IE	197,883
KIØOV	150,084
KR1ST/4	141,300
W6YJ	137,940
W6RCL	109,716
W7/KH7YD	90,117

Assisted, All Band

W2RE	5,921,160
K3WW	5,524,008
K2NG	4,732,595
N2MM	4,416,000
W1US	4,384,860
AA1K/3	4,161,241
K3PP	3,938,159
W1GD/2	3,811,293
W4NF	3,713,235
AA3B	3,627,942

Multi-Op, Single Trans

N4PN	6,490,108
K8AZ	6,027,318
NØNI	4,932,074
K1IR	4,836,000
N1MM	4,569,120
KØRF	4,540,791

Multi-Op, Two Trans

N3RS	11,461,072
K4JA	11,091,128
KI1G	9,920,961
N2NT	9,834,670
K1KI	9,626,703
W6KK	6,957,630

Multi-Op, Multi-Trans

KC1XX	19,390,428
W3LPL	17,683,044
K9NS	16,150,140
N4TO	13,218,114
N2RM	12,788,160
W4MYA	10,575,400

EUROPE
All Band

GD6IA	6,090,309
GM7V	5,691,290

SN7Q	5,430,567
GW4BLE	5,251,157
HA8JV	4,998,371
S57DX	4,959,416
EA4KD	4,785,046
EA3NY	4,367,994
EA5DFV	3,910,340
RM4W	3,742,992

28 MHz

9A9A	1,598,832
EA3QP	1,312,329
S58D	1,024,200
S50K	1,018,868
YU1ZZ	833,924
DFØWA	832,020

21 MHz

TM9R	1,029,888
YT6A	1,027,140
TM7XX	1,001,222
IY4W	985,136
UXØFF	962,298
S57O	886,405

14 MHz

9A6A	1,105,808
OK1RI	1,098,240
OH2BH	916,943
SL3A	851,228
RZ3AA	688,560
YZ9A	635,719

7 MHz

S50A	574,896
9A5E	470,960
YT7A	418,264
LY5A	404,337
SP6IXF	320,324
OHØNL	242,496

3.7 MHz

OE6Z	192,170
YTØA	189,244
OMØC	184,140
S54E	174,570
EI8IR	159,965
I4AVG	133,533

1.8 MHz

S57M	77,784
OZ3SK	56,092
EU6EU	49,876
4O6A	49,476
LY2HM	42,813
DK9IP	30,015

Low Power
All Band

LY7Z	3,278,436
EA7RM	3,229,525
9A2EU	2,531,504
IO4C	2,379,776
HA1CW	2,255,082
DL4MCF	2,195,445
LY9A	2,181,438
Z36W	1,980,690
RM3C	1,892,019
RU3QW	1,782,804

28 MHz

YT1LD	724,005
EA7FTR	528,984
EA6DD	501,084
CT1ESO	470,158
9A5KV	448,414
IZ5CML	381,140

21 MHz

OK1TN	361,916
EA7HBP	352,728
8S7A	291,146
US7IGF	278,025

DL2DBH	274,205
YU7KWX	265,512

14 MHz

YU7ZZ	388,512
EA3GHZ	293,058
IK3UMT	217,626
EU2MM	183,754
UX3MR	132,464
SP9EWO	127,302

7 MHz

EU1AZ	51,429
UZ5U	49,868
SM6DOI	40,020
PA1TT	38,335
EA3FF	19,789
OK1KT	18,122

3.7 MHz

T94YT	80,238
DH6LS	56,050
4NØB	41,144
OK2HI	39,120
OK1FPS	36,660
LY2OW	35,428

1.8 MHz

HA8BE	40,460
S5ØO	38,304
LY3UM	28,050
SP4ZO	25,380
G3UEG	24,366
SP9RPW	24,192

QRP, All Band

F5BEG	1,158,573
SP3KEY	963,795
YT7TY	925,010
IK5RUN	360,914
DF1DX	304,720
YU1LM	255,636
SP3BLT	227,304
OK2KFK	205,088
RX3RC	203,008
GW3JXN	186,624

Assisted, All Band

GI5W	7,364,135
DL6FBL	5,409,850
S5ØS	5,372,406
OE1A	4,625,844
S52ZW	4,442,397
TM2V	4,374,500
DLØWW	4,031,384
OM5A	3,706,748
OM8A	2,853,144
DJ2YA	2,840,489

Multi-Op, Single Trans

TM5C	12,661,826
IQ4A	10,825,835
OK5W	9,372,156
SY8A	9,037,980
9A1P	8,750,095
HG1S	8,696,104

Multi-Op, Two Trans

RW2F	14,163,303
IR4T	13,508,030
9A7A	13,292,224
RU1A	13,160,616
TM2Y	12,863,878
MUØC	12,178,992

Multi-Op, Multi-Trans

DFØHQ	16,503,110
OT2A	15,491,868
TK4Z	14,440,401
GM5A	9,293,412
ED7VG	9,280,804
HBØ/HB9AON	8,743,140

AMERITRON *True Legal Limit*™ Tuner

Easily handles 1500 Watts continuous carrier even on 160 Meters . . . High-current edge-wound silver plated Roller Inductor . . . Two 500 pf high capacitance tuning capacitors with 6:1 vernier reduction drives . . . 3 core choke balun . . . Six position antenna switch . . . True peak reading Cross-Needle SWR/Wattmeter . . .

Call your dealer for your best price!

AMERITRON ATR-30

$599

Suggested Retail

- *Handles 1500 Watts carrier*
- ***Super High Current edge-wound silver plated Roller Inductor***
- ***500 pf tuning capacitors with 6:1 vernier reduction drives***
- ***3 core choke balun***
- ***6 position antenna switch***
- ***True peak reading meter***

AMERITRON's ATR-30 *True Legal Limit*™ roller inductor antenna tuner is ham radio's toughest! It'll handle 1500 Watts *continuous carrier output* on *all* modes and *all* HF bands into most antennas -- even on 160 Meters where most antenna tuners fail.

It's perfect for Ameritron's most powerful amplifiers where the ATR-30 just loafs.

All band coverage lets you operate 1.8-30 MHz including all MARS and WARC bands.

Super High Current Roller Inductor

You'll see Ameritron's new *super high current* air core roller inductor. It's *edge wound* from a thick solid copper strip and silver plated. This produces a large surface area and a massive conductor. It can carry huge circulating RF currents and withstand tremendous heat that'll melt or burn ordinary roller inductors.

A gear driven turns counter and crank knob gives you precise inductance control.

Two 500 pf Tuning Capacitors

Two 500 pf -- *the highest of any antenna tuner* -- variable transmitting capacitors give you no-arc wide range impedance matching for true high power performance.

6:1 vernier reduction drives makes capacitor tuning smooth and easy.

Super Balun, 6 position Antenna Switch

Super heavy duty three core choke balun lets you match virtually any balanced feedline antenna without core saturation.

A 6 position antenna switch lets you select your desired operating antenna.

Read *true* Peak Power

Ameritron's active electronic *true* peak reading meter accurately reads forward and reflected power and SWR *simultaneously* on a lighted Cross-Needle meter.

Roomy Cabinet maintains High-Q

Roomy extra-strong .080 inch thick aluminum cabinet gives highest efficiency and lowest loss. 13¼Wx5⅝Hx17½D inches.

AMERITRON ATR-15 Antenna Tuner

ATR-20, $459. Handles a full 1.2 kW SSB and 600 Watts CW. It's designed to safely handle the full SSB power of Ameritron's AL-811/811H/80B, ALS-500M/600 and other 1.2 kW SSB amplifiers. Compact all metal cabinet.

Ameritron has the best selection of *TrueLegalLimit*™ HF Amplifiers

AMERITRON's legal limit amplifiers use Peter Dahl super heavy duty Hypersil power transformer capable of 2500 Watts!

Ameritron's *most powerful* Amp

with Eimac® 8877 ceramic tube

AL-1500

$2995

Suggested Retail

TrueLegalLimit™

Ameritron's *most powerful* amplifier uses the herculean Eimac® 8877 ceramic tube. It's so powerful that 65 Watts drive gives you the full output power -- and it's just loafing because the power supply is capable of 2500 Watts PEP. All HF bands, all modes. 77 pounds, 18½Dx17Wx10H in.

Ameritron's *toughest* Amp

with Eimac® 3CX1200A7 tube

AL-1200

$2545

Suggested Retail

TrueLegalLimit™

Get ham radio's *toughest* tube with AL-1200. The Eimac® 3CX1200A7 has a 50 Watt control grid dissipation and the lowest history of field replacement of any modern transmitting tube that we use. 90 Watts in gives you full power out. All HF bands, all modes. 76 pounds, 18½Dx17Wx10H in.

Ameritron's *classic* Amp

with 2 graphite plate Amperex® 3-500ZG tubes

AL-82

$2495

Suggested Retail

TrueLegalLimit™

Most linears using 3-500s can't give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential. AL-82 is ham radio's *only* super 3-500 amp! 100 Watts in gives you full power out. All HF bands, all modes. Hefty 76 pounds, 18½Dx17Wx10H inches.

1.5 *plus* kW SSB HF Amp

with 2 Eimac® 3CX800A7 tubes

AL-800H, $2595 suggested retail. Two Eimac® 3CX800A7 tubes produces 1500 *plus* Watts SSB PEP with 55 Watts drive. 52 lbs., 8½Hx16½Dx14¼W in. **AL-800, $1775** suggested retail, single 3CX800A7, 1250 Watts out with 70 Watts drive.

NearLegalLimit™ Amp

with four Svetlana® 572B tubes

AL-572, $1395 suggested retail. New class of *Near Legal Limit*™ amplifier gives you 1300 Watts SSB PEP power output (70 Watts drive) for 65% of price of full legal limit amps! Instant 3-second warm-up. 40 lbs. 8½Hx15½Dx14½W inches.

1 kW Desktop HF Amp

with Amperex® 3-500ZG tube

AL-80B, $1299 suggested retail. Gives you full kilowatt SSB PEP output (85 Watts in) from a whisper quiet compact desk- top linear. 8½x14x15½ in. Plugs into 120 VAC outlet. Graphite plate *Classic®* 3-500Z tube. Nearly 70% efficiency. Weighs 48 lbs.

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BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

Number groups indicate: QSOs/Zones/Countries on each band

WORLD TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
KP3Z	85\9\27	431\20\76	711\31\98	2384\39\140	2009\34\128	3036\32\123
CN2R	103\9\46	228\17\65	407\18\76	1568\30\118	1213\35\122	3762\36\125
PTØF	24\9\19	134\16\49	274\19\45	2604\33\117	1569\32\126	2905\29\116
3V8BB	126\8\50	289\15\75	544\23\89	1341\37\125	1022\32\122	2364\35\131
P4ØB	87\6\15	184\13\39	524\25\74	1564\31\96	1550\32\93	2561\27\102
9K9X	59\8\27	145\12\52	359\28\92	1411\36\134	1193\34\125	1601\34\115
FS/AH8DX	120\12\32	294\11\34	320\19\69	1251\28\98	1995\31\118	2335\29\117
VE3EJ	204\11\25	360\19\65	399\29\92	672\35\128	1227\37\133	1741\33\132
VY2ZM	138\9\38	385\17\70	537\24\78	1117\35\116	1161\31\108	1498\30\109
KQ2M/1	23\6\13	201\19\71	234\27\84	822\36\146	1281\37\140	1263\33\127

USA TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
KQ2M/1	23\6\13	201\19\71	234\27\84	822\36\146	1281\37\140	1263\33\127
K4ZW	29\9\18	164\20\70	162\25\77	475\33\117	1231\33\138	1113\32\128
N9RV	19\7\13	93\15\52	235\21\68	731\37\124	1058\36\125	1108\33\109
K5ZD/1	27\9\16	157\17\69	201\23\82	581\35\120	692\33\126	1101\31\121
K3ZO	8\4\7	112\16\56	142\19\62	498\32\114	1123\33\121	1215\32\125
W9RE	24\7\13	148\24\70	173\24\78	568\35\126	812\32\124	864\33\121
WB9Z	32\13\20	128\20\61	153\26\73	337\33\106	575\33\118	1274\35\130
W2WB	25\6\15	87\17\59	99\20\72	451\34\130	522\32\125	1265\33\142
W3BGN	35\8\16	164\17\65	135\22\66	465\35\101	654\33\112	1053\29\115
K3CR	19\7\13	96\15\54	213\22\79	540\34\122	859\33\116	579\27\102

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

HC8A	24\8\22	426\24\77	962\32\109	2015\37\154	1249\37\148	5117\36\144
EA8ZS	56\11\52	171\17\92	523\33\114	2474\38\161	2125\38\165	2712\39\158
8P8P	81\8\25	459\19\84	890\31\109	2048\39\148	2695\38\156	3704\37\156
P3A	146\9\52	543\15\76	725\25\99	2368\39\154	2194\35\141	2915\37\153
TM5C	177\10\60	822\21\94	594\33\110	1421\38\159	1189\39\153	1952\39\166
KHØAA	1\1\1	114\16\24	487\29\65	1616\38\142	2432\37\129	2222\37\129

USA MULTI-OPERATOR SINGLE TRANSMITTER

N4PN	22\8\19	70\16\54	180\30\97	830\36\143	864\35\145	1386\34\156
K8AZ	26\11\24	96\21\74	214\30\100	475\37\147	585\35\140	1436\34\150
NØNI	19\8\14	97\20\62	213\31\102	462\38\143	765\36\146	973\33\149
K1IR	12\5\11	307\17\85	217\24\95	419\34\132	719\32\133	888\33\143
N1MM	20\5\12	86\14\52	159\22\80	572\33\138	733\32\129	939\30\137
KØRF	19\10\17	100\21\62	334\31\105	415\38\140	929\37\147	498\32\139

WORLD MULTI-OPERATOR TWO TRANSMITTER

PJ2T	37\7\21	511\18\64	1624\30\109	2762\36\142	4349\38\153	3633\32\139
ZD8Z	4\4\4	163\21\68	386\27\74	1897\36\136	3775\39\165	5059\39\157
CT9L	116\10\49	406\16\73	498\22\91	2364\38\140	2869\38\152	3306\40\157
V26B	171\8\23	488\18\61	748\27\86	2514\32\123	3739\40\155	3464\31\137
ZW5B	3\2\2	26\15\26	200\27\82	1199\38\141	2934\39\164	3794\39\170
RW2F	446\11\61	1082\27\97	1178\34\114	1577\39\157	1918\39\151	1871\39\162

USA MULTI-OPERATOR TWO TRANSMITTER

N3RS	18\7\11	316\21\89	290\31\104	1042\40\164	1954\39\170	1517\34\158
K4JA	45\13\29	351\22\92	532\32\116	1050\38\161	1343\38\154	1459\35\162
KI1G	35\11\22	260\21\85	336\26\98	938\39\155	1301\38\155	1505\34\153
N2NT	40\9\20	359\22\91	286\29\99	963\38\152	1521\36\149	1432\33\152
K1KI	22\7\14	248\20\77	377\30\103	1137\39\154	1312\33\149	1514\33\148
W6KK	16\8\8\0	107\18\35	374\30\86	467\37\145	1712\37\154	1183\33\139

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

IH9P	842\12\73	1867\26\111	2367\33\117	4693\39\164	3931\39\168	4080\39\167
A61AJ	285\10\57	639\25\91	1502\35\120	3643\38\171	3358\38\168	3949\40\177
CQ9K	164\11\54	657\20\84	671\28\102	3983\39\161	4057\39\162	3727\40\161
KH7R	163\10\11	703\27\51	1699\37\97	2966\39\150	3832\38\153	4028\39\122
YV4A	193\10\26	726\20\76	1237\31\102	3056\38\152	3495\37\158	3263\32\136
KC1XX	201\15\39	676\28\109	651\32\121	2042\39\173	2326\39\173	2137\35\169

USA MULTI-OPERATOR MULTI-TRANSMITTER

KC1XX	201\15\39	676\28\109	651\32\121	2042\39\173	2326\39\173	2137\35\169
W3LPL	327\16\38	628\25\101	658\32\118	1760\39\177	2034\39\161	2084\37\165
K9NS	189\15\33	267\26\84	559\33\116	1658\40\173	2149\40\175	2119\35\170
N4TO	116\10\25	239\24\82	537\31\122	1731\39\166	1798\39\164	1808\35\166
N2RM	39\12\23	535\26\100	471\29\106	1276\39\160	1726\38\159	1690\33\155
W4MYA	100\14\26	423\23\95	333\31\111	875\37\148	1451\39\151	1693\36\163

place went to the fine team at 8P8P. They certainly did well from a 2-point area.

In Europe top honors went to the team from TM5C. Second place went to the team operating from a mountaintop near Bologna, IQ4A. Third place went to OK5W.

Shiro, JF6DEA, as XU7ACD on the air. →

Number one World Multi-Single was HC8A. Shown left to right: XE1KK, N5KO, and W6NL. Not pictured is the fourth member of the team, K6BL.

Operating from George Island, Florida, the top position in the U.S. went to N4PN. A great job, guys! Second place went to K8AZ located just east of Cleveland, Ohio, and third went to NØNI. Tony`s team did a world-class effort from Iowa. The top scorer from the west was W7VJ.

Continental leaders were 8P8P (NA), EA8ZS (AF), P3A (AS), TM5C (EU), KHØAA (OC), and HC8A (SA). A new Oceania record was set by KHØAA.

Multi-Two

The new Multi-Two category drew interest from all over the world. What a great way to have fun and get new contesters involved. Why not try it in the 2003 contest? Just a tribander and dipoles on 15, 40, and 80 can make it happen.

Jumping into the deep end of the QSO pool and coming up number one was the crew at PJ2T. Operating just east of the Coral Cliff Hotel on Curacao, all their hard work to create a FB contest station paid off big time. Second place went to ZD8Z operating from Ascension Island. This team handed out a lot of double multipliers. Another African station working lots of stations was CT9L, who finished third in the world.

In the U.S. Sig, N3RS, assembled a great team to try out the new category. They took top honors. Second place went to the fine station of K4JA located in northeastern Virginia. Third place went to KI1G. The top West Coast station was W6KK.

The European top scorer was RW2F. Leaving Multi-Multi to flex their muscles in the Multi-Two category really paid off for this fine group of operators. Second place went to the IR4T team. Operating from a water tower in central Italy provided a sure ground and lots of contacts. Third place went to the team at 9A7A.

Continental leaders were V26B (NA), ZD8Z (AF), RK9CWW (AS), RW2F (EU), AH2R (OC), and PJ2T (SA).

Multi-Multi

Wearing yellow team shirts at the Dayton Hamvention® this past May, the IH9P boys celebrated their well-deserved world-high victory. Traveling to Pantellela Island from Sicily with all your gear in tow is hard

EUROPE TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
GD6IA	173\6\45	280\11\59	195\15\68	749\29\105	1153\32\113	1911\31\125
GM7V	108\6\42	484\13\69	504\20\78	858\34\111	1042\37\121	1153\31\120
SN7Q	173\5\44	288\12\58	392\26\76	577\24\78	1611\35\108	1093\36\111
GW4BLE	54\5\33	443\16\68	499\19\75	440\26\87	851\30\102	1547\34\112
HA8JV	234\7\54	727\16\77	384\23\90	831\32\108	1564\34\115	433\29\88
S57DX	149\7\42	329\10\61	371\23\81	923\34\126	730\33\106	1016\36\120
EA4KD	39\4\28	210\13\58	457\20\77	1001\31\117	1007\32\100	1060\30\112
EA3NY	30\4\22	119\7\42	314\20\68	891\33\103	1236\29\98	1035\32\99
EA5DFV	55\5\34	147\9\51	269\15\56	655\26\83	1141\25\91	1410\31\104
RM4W	41\8\28	81\11\45	376\20\70	865\35\115	845\29\108	656\33\110

EUROPE MULTI-OPERATOR SINGLE TRANSMITTER

TM5C	177\10\60	822\21\94	594\33\110	1421\38\159	1189\39\153	1952\39\166
IQ4A	50\7\50	251\17\80	698\35\119	1201\39\153	1337\38\149	1860\39\161
OK5W	52\10\51	583\17\83	922\33\124	999\39\157	1596\39\159	769\39\163
SY8A	215\8\51	455\14\71	468\23\94	1650\36\127	1535\35\123	2674\36\138
9A1P	114\6\50	318\13\75	275\24\96	1290\38\151	1210\37\144	1968\38\157
HG1S	165\8\49	417\14\70	704\29\109	892\38\152	1169\39\146	1568\39\163

EUROPE MULTI-OPERATOR TWO TRANSMITTER

RW2F	446\11\61	1082\27\97	1178\34\114	1577\39\157	1918\39\151	1871\39\162
IR4T	239\10\61	675\19\85	981\33\121	1192\39\154	2015\37\149	1947\38\159
9A7A	382\10\57	989\19\81	1044\31\114	1377\37\143	1888\37\147	2081\39\154
RU1A	216\8\50	674\26\94	1205\35\124	1961\39\162	2067\38\153	1561\38\164
TM2Y	186\10\56	838\18\81	1149\33\108	1731\38\155	1912\38\145	1556\35\146
MUØC	388\9\57	864\14\75	917\25\96	2065\37\141	1800\34\136	1985\34\146

EUROPE MULTI-OPERATOR MULTI-TRANSMITTER

DFØHQ	709\10\69	1461\24\103	1978\34\121	1704\39\156	2011\39\160	1819\39\168
OT2A	812\10\59	1234\16\86	1836\33\114	1850\39\152	1863\38\153	2149\39\164
TK4Z	227\6\50	794\11\70	1976\23\92	3455\34\144	2445\33\121	2358\31\112
GM5A	459\11\61	873\12\74	1369\24\97	1681\39\146	1558\37\144	1366\31\131
ED7VG	80\6\29	576\19\78	1126\27\97	2298\29\109	2318\30\118	1620\28\106
HBØ/HB9AON	474\9\61	1202\14\82	1236\24\98	2083\33\138	1198\34\122	909\29\112

EA8ZS, Mult-Single from the Canary Islands. Left to right: front row, OH2MM, OH2JTE, OH2BH, OHØXX; back row, OH2TA, OH2PM, OH1MA, EA8ZS, OH1RY. (Not pictured, EA4DX)

enough, but then setting it all up and tearing it down within a week really is *work*. Second place went to the fine crew who put A61AJ into many logs. Ali's world-class station is a beacon on many bands, and his operating crews are always very international. Third world high went to CQ9K.

The team of Rhein-Ruhr DX Association and CT3 operators made being able to work zone 33 a certainty. Team Quad, DFØHQ, took the opportunity to talk their way to the top of the European Multi-Multi list. Second place went to OT2A. Both stations had to survive the vicious gales that blew through central zone 14. Third place went to TK4Z. Made up of TK, U.S., and F operators, their signal made a lot of country hunters happy.

Here in the U.S. there was a real battle. After all was finished, KC1XX took top honors. In second place was Frank, W3LPL's crew located in central Maryland. Special mention goes to third-place K9NS for an outstanding job from "not the East Coast."

The first Chinese DXpedition in the Multi-Multi category was initiated by XX9C! Congratulations to all the fine BY and XX ops for your effort! Another fine job was done way out in the Pacific by ZK1MA. Zone 2 was on big time with VC2C.

Continental leaders were KC1XX (NA), IH9P (AF), A61AJ (AS), DFØHQ (EU), KH7R (OC), and YV4A (SA).

Teams

Team contesting is a blast. Get together with five of your friends from anywhere in the world, get on the air in the contest, and submit a team list. That's all there is to it. This year 14 teams submitted scores. The top team was the Friendship Worldwide Team (CN2R, D4B, D44TD, P40W, PTØF) with a score of 56,455,465. Check out the ops for all the teams in the score listings. Second place was the Bavarian Lederhosen (DH1TW, DLØWW, DL4NAC, DL6FBL, JY9QJ) with 22,514,353. Third place went to WWYC Team A (UT7L, LX7I, NR3X, GØMTN, ON4CCP) 7,568,344. The rest of the teams in score order were: CCF PileUp (LY2CY, OH2LU, OH2RA, OH6NIO) 5,424,726; Minnesota Wireless Assn. (ACØW, KOØB, KØTO, KH6/NOHJZ, KH6/WA2HFI) 4,571,027; CCF High Energy (LY7Z, OH6OS) 3,500,052; CCF Post Teens (OH2BH, OH5B, OH8L, OH2BP) 1,840,394; CCF Team Gimme Ten (OHØXZ, OH1LEG, PJ4/OH1VR) 1,768,592; CCF Sweet Fifteen (OHØV, OH1F) 1,367,498; WWYC Team B (M2Z, HA3LN, DL7FER) 475,779; TA2BK is on the air Team 3 (TA3D, TA2GS, TA2LJ, TA1EM, TA1EQ) 351,468; TA2BK is on the air Team 2 (TA3J, TA1ED, TA1DX, TA1E/Ø) 332,242; TA2BK is on the air Team 1 (TA3YJ, TA1BM, TA3AK, TA2IB, TA1EJ) 273,641; and Mediterraneo DX Team (IZ8CCW, IZ8BGY) 129,090.

Special Mention

Turkey produced a wonderful turnout in the contest. There were 24 entries! Congratulations to our friends in Turkey on their organized effort to enter the CQ WW and honor the memory of Bahri, TA2BK. Another country with greatly increased activity was India, with over 25 different calls in the database.

Every year hundreds of contesters head out on DXpeditions to have fun and make the contest more interesting for all of us. This year some of the travelers were V31BD, ZF2NT, ZF2AH, TI8/W5AA, J37LR, 6Y9X, 6Y5/ N7CQQ, TO5A, KP3Z, V47KP, FS/AH8DX, KP2A, KP2/K2SGH, IG9A, IG9V, TYØT, TY3M, D44TD, SU9US, ET3AA, 9G5MD, CN2R, 5NØNHD, 6W/F6HLC, ZS6Z, 3V8BB, 9S1X, XU7ACD, BY1DX, BD8TG, YI9OM, A45WD, 4U1VIC, OHØXZ, OHØV, TA1E/Ø, TA1/ DL4ZBC, GD6IA, ERØND, JW5E, T88EA, 9M6A, V63B, KH6/NØHJZ, KH6/WA2HFI, T2DX, R1ANZ, P40A, P40W, CEØZ, PJ4/ OH1VR, PTØF, R1ANF, 9Y4TBG, 9Y4/NG5E, C6A/VA3SWG, TT8ZZ, J79UF, SMØ/G4VGO, D4B, 4X/NP3D, BW3/UA3VCS, OHØMPO, OT2T, GI5W, KH6/K1ER, P40P, 8P8P, VP9I, HQ3J, VP2MPA, VP5B, VP5DX, EA8ZS, CT9Z, P3A, J49Z, LX7DX, KHØAA, R1ANC, HC8A, V26B, C6ARB, 8P6K, VE2/KD3RF, TI8/K4QFF, HI9X, V47NS, ZD8Z, NP2B, CT9L, 8N1OGA, OHØZ, MUØC, MD4K, MJ/DL1EK, LX5A, ZL7C, AH2R, ZK1CG, PJ2T, VP2E, ZW5B, VC2C, TI5N, J3A, VP5T, IH9P, CQ9K, XX9C, A61AJ, TK4Z, HBØ/ HB9AON, ISØA, KH7R, ZK1MA, PJ7/K7ZUM, WP2Z, and VQ9X.

We all hope for more contest participation in the future. All the operators at RK9SWP were 15 years old! It's great to see so many young contesters. In another interesting piece of data, Dick, N6AA, by operating from TK4Z in zone 15, completed a *unique* WAZ. His quest to operate from all 40 zones in the CQ WW is finished! Not far behind is Phil, N6ZZ, who just needs three more.

Please check out the battles that took place in the 5, 7, 8, 9, and Ø call areas in the U.S. Very close efforts were also seen in the Multi-Single category in England, The Netherlands, Sweden, Yugoslavia, and Turks and Caicos.

Records

The following stations set new records. Congratulations on your fine efforts.

World: D44TD (LA), TA3J (L1.8), P40P (AA), PJ2T (M2)
North America: KP3Z (A), KP4KE (Q21), V26B (M2)
Africa: D44TD (LA), D4B (AA), EA8ZS (MS), ZD8Z (M2)

(Continued on page 102)

A few new radios, a few new antennas, and a ton of accessories and books ... the one-sentence wrap on Hamvention '03.

Hot Stuff at Hamvention® 2003

BY RICH MOSESON,* W2VU

Very. It's the adjective most closely associated with the Dayton Hamvention®—very hot, very cold, very muddy, very rainy, very big, very overwhelming for the first-timer ("You mean there's another room?" "I mean there are four other rooms!"). Whatever else it may or may not be, Dayton is always "very." This year, it was very rainy. That made it very bad for the folks in the flea market, and very good for the people inside; and if you were looking for new gear, inside was the place to be anyway.

The rain made the corridors and exhibit halls very crowded with happy (if slightly damp and bedraggled) hams. It wasn't until Sunday morning that I was able to escape from the CQ booth long enough to do my annual "what's new" survey. Actually, the survey started right *at* the CQ booth, which was in a new location (in the main arena) and which featured a wide array of new books, both from us and from other publishers.

*Editor, CQ
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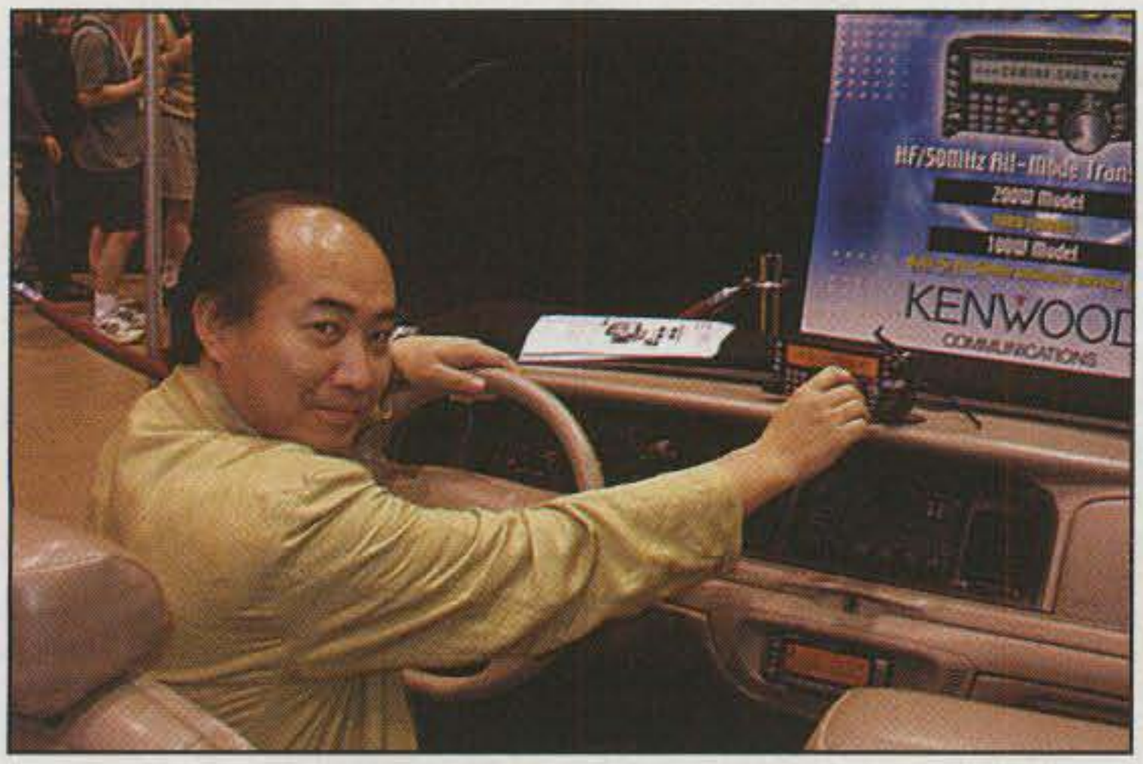
It's fascinating to me to see how a whole industry thinks, especially when it seems that we're pretty much all on the same page, even though we don't share plans in advance for obvious competitive reasons. But with the U.S. economy in a slump, and Japan's even worse, the focus this year was more on new products to help hams make the most of their current radios, rather than a raft of new radios that many of us can't afford to buy right now. We counted five new radios, one new amplifier, nine new antennas, more than 20 new books and CDs, and some 30 new accessories. Let's start with radios and other devices that generate RF energy:

Radios

The biggest buzz about radios surrounded ICOM's unveiling of the IC-7800, a full-color, 200-watt HF+6-meter transceiver with more buttons and dials than I could count. It features two independent receiver circuits, four 32-bit DSP (digital signal processing) units—one for the transmitter, one each for the two receivers and the fourth for the spectrum scope—the ability to operate RTTY and PSK-31 without a computer, a built-in digital voice recorder, and more. This is not a backpacking rig; it's just over 16 × 16 inches around (and just under 6 inches high), and weighs in at more than 50 pounds! ICOM says it spared no expense in designing and building this radio ... and you won't, either, if you buy it. The price is somewhere in the neighborhood of $10,000. If cost is no object, you'll most likely get your money's worth.

ICOM's new IC-7800 is a top-of-the-line HF+6-meter transceiver designed for fixed-station use.

Much smaller, much lighter, and most likely much easier on the checkbook is Kenwood's new (yet unnamed) HF+6-meter mobile transceiver. It will come in two models, a 100-watt version with a built-in antenna tuner and a 200-watt transmitter (100 on 6) without the tuner. It will be ready to operate on the new 60-meter band, includes various DSP features, a built-in memory keyer, a detachable control head, and a Packet Cluster tune function when used in conjunction with a TM-D700 VHF transceiver. A unique feature: *CQ*



Kenwood engineer Toshio Torii, JA6QXW, poses with his newest creation, an as yet unnamed HF+6-meter mobile rig. When released it will include operation on the new 60-meter band.

The Ten-Tec Titan III amplifier runs 1500 watts PEP on all amateur bands between 160 and 15 meters (except 60 meters), and can be modified to operate on 12 and 10 meters if you have proof you're a licensed ham.

Contributing Editor Gordon West, WB6NOA, who will be doing a field review of this radio when it's released, says the 200 watt version runs on *two* 12-volt power cables, each running about 30 amps average and 40 amps peak current. At home, you'll need dual 40-amp power supplies; in the car, you'd best keep the engine running when operating at high power, to counter that 60–80-amp drain on the battery!

Yaesu (Vertex-Standard) introduced two new radios, the dual-band VHF/ UHF FT-8800R mobile with 50 watts out on 2 meters and 35 watts out on 70 centimeters. (It's a dual-band version of the four-band FT-8900.); plus the VX-2R handheld, which Yaesu bills as the world's smallest dual-band HT with wideband receive. The receiver covers 500 kHz to 960 MHz (except for cellular frequencies and 730–799 MHz. The transmitter puts out 1.5 watts on 144 MHz and 1 watt on 440 MHz (3 and 2 watts, respectively, on an external 12-volt power supply). It features more than 1300 memory channels, broken down into 20 groups, an ultra-thin Lithium-Ion battery, and WIRES internet linking capability.

Yaesu's VX-2 handheld is billed as the world's smallest dualband handheld transceiver with wideband receive (500 kHz to 960 MHz, minus cellular, and 730–799 MHz). ←

Another new entry in the VHF FM mobile field is ICOM's IC-208H, a two-band 2-meter and 70-centimeter (one at a time) transceiver with 55 watts out on VHF and 50 watts on UHF, plus 500 memory channels (in 10 banks of 2–100 memories each) and expanded receive that includes 118–173, 230–549, and 810–999 MHz (minus cellular frequencies, of course; one wonders why that middle range couldn't start at 220 instead of 230 and include 222–225 MHz receive), all in a very small package with a remote-head option.

This year's new entry from Ten-Tec is the Titan III 1500-watt linear amplifier. It comes ready to operate on all amateur bands from 160–15 meters (except 60 meters), and Ten-Tec will provide modification instructions to open up 12 and 10 meters if you provide proof of a current amateur license. A complete desktop unit, it weighs in at 84 pounds and runs on two Svetlana 4CX800A ceramic tetrode power tubes in a grid-driven configuration. It comes with full break-in transmit/receive switching standard, plus a variety of protective circuits to keep the Titan III "safe from operator error," a nice way of saying it's pretty much idiot-proof.

Elecraft's transverters for 6 meters, 2 meters, and 222 MHz will put your K2 or any other HF rig on VHF SSB and CW.

Elecraft is expanding into VHF with a line of transverters that are designed for the K2, but will work with virtually any HF radio. There's a 6-meter model, which puts out 20 watts with about 8 watts in, a 2-meter transverter, and one for 222 MHz, both of which put out about 25 watts. All three feature a noise figure on receive of 1 dB or better. The transverters are priced at $349 each.

Antennas

Array Solutions, the U.S. importer for the German Optibeam, introduced the OB2-40, a 2-element 40-meter Yagi. Each element is 49 feet long; they're both mounted on an 18 1/2 foot boom. The antenna sells for $1295.00.

Degen, a relative newcomer to the U.S. ham market (the company is based in Canada), generated quite a bit of interest with its "Baby Boomer Quad." They have two models, a tri-band quad for 10, 15, and 20 meters; and a monoband version designed for 10 meters but which can be ordered for other bands as well. What sets apart these antennas is that they are

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portable, fold down into an 8" × 8" × 6' box, and can be put up and taken down by one person, making them attractive candidates for Field Day or emergency setups. The 10-meter monobander is $480 U.S., and the tribander is $678 U.S.

Fluidmotion has two new offerings, a 4-element Yagi and two sizes of SteppIR verticals. All operate on the principle of an adjustable copper strip inside a fiberglass tube, which extends or contracts as needed for whatever band you choose.

High Sierra has upped the ante in the motorized mobile HF antenna competition, introducing the Sidekick, which is only 15 inches high (minus a 3-foot whip) and ranges in total height between 4 and 4 1/2 feet. Plus, it weighs in at about 2 pounds, making it just right for safely attaching to a no-holes trunk-lip mount.

High Sierra's new "Sidekick" motorized mobile HF antenna weighs only 2 pounds and stretches to only 4 1/2 feet when fully extended. →

Speaking of HF mobile, Iron Horse has added a line of mini HF Stick antennas. Each is a single-bander; you need to change antennas in order to change bands, but it could be an attractive option if you're on a tight budget but still want to operate HF mobile.

MFJ introduced three new antennas, including a manual screwdriver (which requires moving the coil—by hand—for each new band); plus a line of single-band dipoles and a wide-coverage discone antenna. There are four varieties of the manual screwdriver, with varying band coverage and whip length. Weight ranges from 1 pound to 2 1/2 pounds.

Accessories

Here's where the list really starts to get long. We'll start with one of the more exciting pieces of gear we've seen in a while, AOR's ARD-9800 Fast Modem. This is an analog to digital (and digital to analog) converter that lets any transceiver send and receive digital voice, high-speed data (3600 bps, but typical HF speed is 300), and digital slow-scan TV. It is compatible with any other radio using the open G4GUO digital protocol. The ARD-9800 attaches to the mic and speaker lines, automatically recognizes received digital or analog signals and activates the correct mode, and operates on SSB by using the same frequencies as microphone audio (300–2500 Hz) to modulate the signal and stay within a standard SSB bandwidth. The ability to automatically recognize signals means you can hear analog signals on your frequency and QSY to avoid interference. AOR says the list price will be about $600, with an expected street price in the $400s.

If you've ever put up a ground-mounted 1/4-wave vertical antenna and driven yourself crazy trying to figure out how to hook up multiple ground radials, DX Engineering has an answer, its new Radial Plate. It's essentially a sheet of stainless steel with an SO-239 for feedline, a U-bolt for holding up the antenna, and 60 bolts with nuts for attaching the ground radials. DX Engineering also has a new insulated boom-to-element clamp for 2-inch booms, making it easier to build a Yagi for a reasonable price.

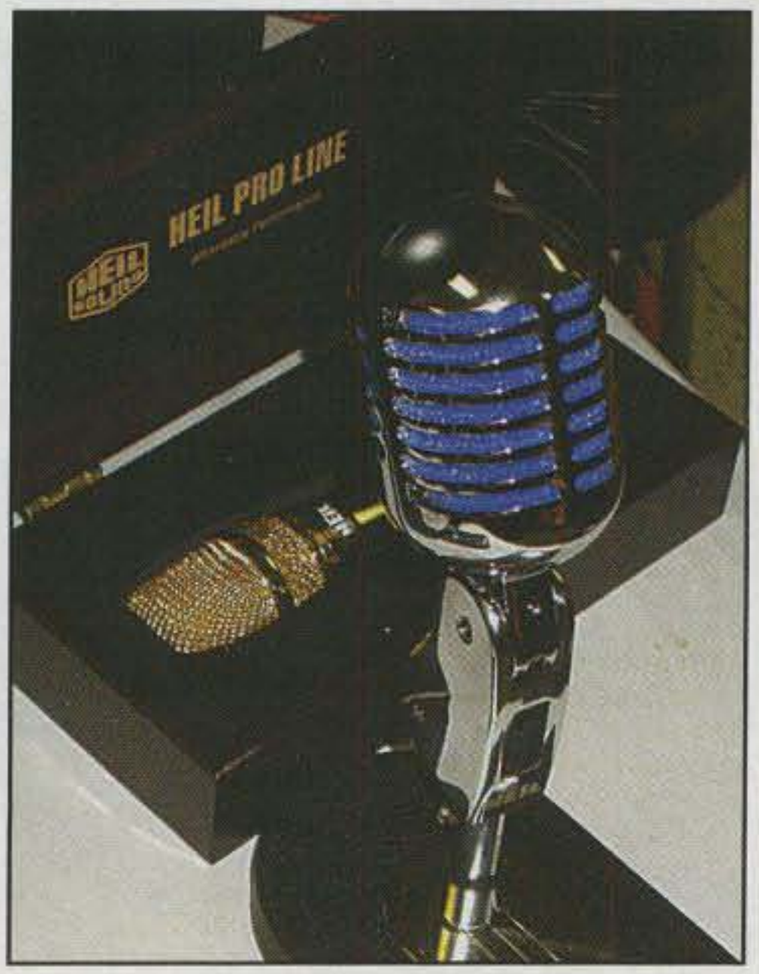
In addition to its transverters, Elecraft has also introduced an internal digital signal processing (DSP) module for the K2, featuring advanced noise reduction and autonotch; plus the KRC-2 band decoder, which detects which band you're on and automatically switches

← *The AOR AD-9800 Fast Modem works through the mic and speaker lines to allow any rig to be used for digital voice, data, and image communications, all within the bandwidth of a typical SSB signal.*

antennas to the right one! It works with the K2 and with ICOM and Yaesu HF rigs as well.

Gap Antennas has brought out a new line of "Quick-Tilt" mounts for antennas on 1 1/4–2-inch masts. The ground-mount version goes about three feet into the soil, while the ladder mount is designed for use on campers and motorhomes. On each, a bolt and wing nut can be removed to tilt down an antenna and put in to secure an antenna in place once it's raised to a vertical position. Gap also introduced the "Hear It" inline module as a companion to its "Hear It" DSP-enhanced speaker. The inline module allows you to use headphones or the speaker of your choice while getting the DSP benefits of the "Hear It" system.

Heil Sound introduced two new microphones and a noise-canceling headset at Dayton. The "Heritage" mic resembles the classic broadcast desk mics of bygone days (similar to the prop mic you see on David Letterman's desk), but with a Heil element optimized for ham communication. The "Pro Line" mic, on the other hand, is a sleek, modern-looking microphone, so there's something for all tastes. In addition, Heil introduced the "Quiet Phone" noise-canceling headphones. We gave them a try—starting with the noise canceling turned off, then turned on—and the difference was quite noticeable. Owner Bob Heil says the same noise-canceling technology will be included in the Pro Set headsets as of this summer.



The classic-look "Heritage" mic (foreground) and the sleek "Pro Line" mic are two of the newest offerings from Heil Sound, which also introduced a noise-canceling headset.

TECH TALK

If you can't hear 'em, you can't work 'em!

Whether DXing from the home QTH, operating portable or communicating while mobile, the classic expression of "If you can't hear 'em, you can't work 'em" always reigns supreme. That philosophy was also a special design consideration in Icom's development of the incredibly popular IC-706MKIIG transceiver. In particular, Icom focused on three interrelated areas: receiver sensitivity, selectivity, and noise reduction. This Tech Talk overviews those areas.

SENSITIVITY. The first and foremost requirement for top-notch receiver performance is high "front end" sensitivity with a low noise floor and wide dynamic range. Realizing that fact, the IC-706MKIIG's most important first mixer stage employs double balanced inputs and outputs for both weak signal amplification and common mode reduction of extraneous noise. The design concept here is simple but most effective: boost signals more than noise and you can hear what others miss!

IC-706MKIIG

Since signal levels vary from day-to-day and band-to-band, the IC-706MKIIG's panel-selectable receive preamp and attenuator also let you step up or reduce front end gain to fit needs at the particular time. This overall combination yields the unique ability to "pull weak stations out of the mud" and it is amazing! Even with a dual balanced first mixer and panel-selectable RF preamp and attenuator, weaker signals can still become masked by external noises. That is no problem for an IC-706MKIIG however. The transceiver's built-in noise blanker stops intermittent/pulse-type noise while its built-in DSP system reduces constant/band-type noise to noticeably improve copy under all conditions.

SELECTIVITY. Equally important for copying signals of all types and levels is sharp IF filtering. Icom's IC-706MKIIG really stands tall here, as its standard/included SSB filter is wide enough to yield full-bodied audio yet steep-skirted enough to cut QRM like a knife. Lacking such steep-skirted selectivity, strong signals can "blast through" or appear to widen a filter's bandwidth, and reducing receiver sensitivity is necessary to avoid that scenario. Comparatively, the standard/included SSB filter in '706MKIIG exhibits a better average signal or –6dB to strong signal or –60dB shaping factor than optional "SSB Narrow" filters from some other manufacturers. Surprising? Not really. Icom always delivers top performance in amateur radio gear!

HEARING IS BELIEVING! Thinking about a new transceiver for home, portable or mobile use? Great idea! Before selecting a particular rig however, remember to compare vital specs. Notice the IC-706MKIIG is first class in sensitivity (0.15µV in the 1.8 to 30MHz range) and selectivity (2.4kHz at the –6dB level, widening to only 4.8 kHz at the strong signal/-60dB level). Factor in initial cost or investment, years of enjoyable use, and later resale/trade value and you will agree that the IC-706MKIIG is today's best buy in an ultra compact transceiver!

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LDG Electronics added two new antenna tuners to its product line: the AT-897, an automatic antenna tuner designed to work with Yaesu's FT-897 transceiver, and the larger AT-1000, an automatic tuner for use with high-power amplifiers. It will handle up to 1 kW on SSB, 750 watts on CW, and 500 watts on key-down digital modes.

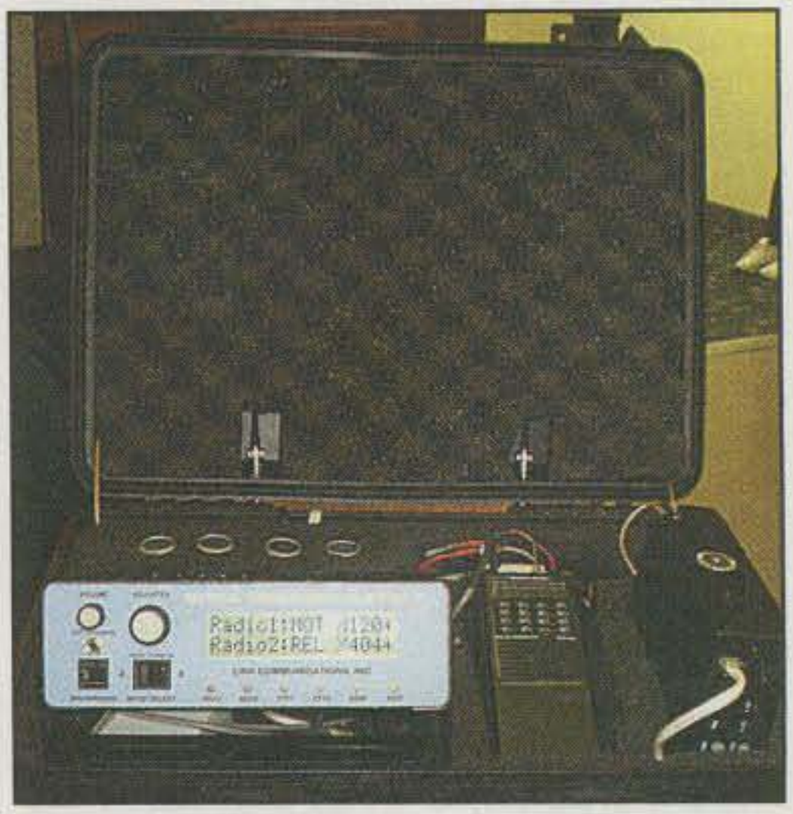
A fascinating new piece of gear comes from Link Communications, the TCB-I Tactical Communications Bridge. The bridge acts as a connection point in the field between two radio *systems,* including those with different protocols. The unit contains a built-in radio database, so the user simply dials up the radios being interfaced and the TCB-I takes care of the rest. It will even link conventional and trunked radio systems, making it an excellent tool for emergency and disaster communications.

M^2 Antennas has a new MT-1000 elevation rotator, which can lift up to eight VHF Yagis and, in conjunction with an azimuth rotator such as the OR-2800, provide complete antenna control for satellite or Earth-Moon-Earth communications. The MT-1000 can be coupled to the azimuth rotator and run with a single cable to a computer-linked controller, such as the RC2800PX programmable controller, which owner Mike Staal says has new software, new features, and much easier calibration.

MFJ, as always, rolled out several new accessories for the ham shack, including an apartment-window mount, a tripod mount, a "Travel Tuner" for small portable HF radios, a dummy load and wattmeter, a wireless weather station, an "atomic watch" that updates itself with signals from WWVB, a 10 Hz to 3 GHz frequency counter, a kilowatt-rated lightning surge protector, and more.

The X-Sweeper from Optoelectronics is a professional-grade near-field receiver that displays signals in a spectrum format on an LCD monitor screen. It covers 30 MHz to 3 GHz and lets a user see all signals present in a frequency range at a given time. This can be helpful for tracking down repeater QRM that occurs only when some other nearby transmitter is active. It also has a professional price tag ($1599 list), so it's really for the serious user.

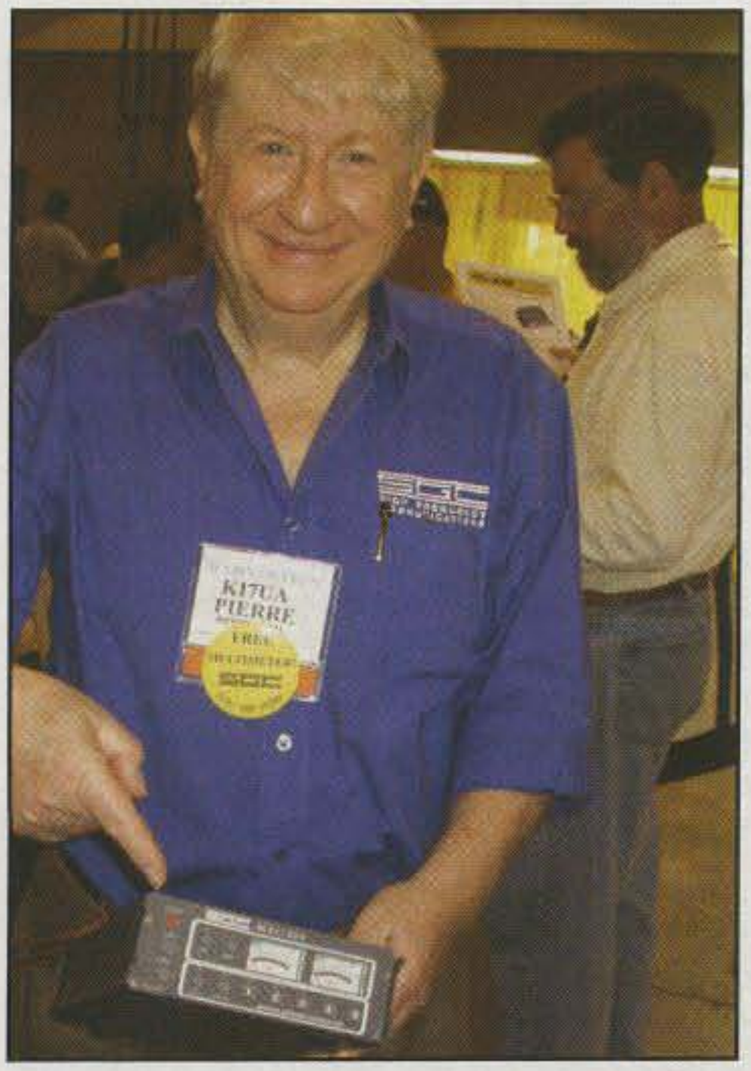
SGC brought three new toys to Dayton. First is the ADSP^2 adaptive digital signal processing board, which will work with virtually any radio. There are two models, one for high power and the other for low power. For additional information, see this month's "What's New" column. The second item is the ADSP^2 speaker, which has the ADSP^2 board built in. Third is the MAC-200 master antenna controller, which is a combination antenna switch and tuner. You can connect up to five different antennas to it, and it not only remembers the set-



The TCB-I Tactical Communications Bridge from Link Communications is designed for emergency use in the field to link together normally-incompatible radio systems.

M^2 Antennas owner Mike Staal, K6MYC, shows us his company's new MT-1000 elevation rotor for satellite and moonbounce communications.

The MFJ Travel Tuner is just one of several new station accessories introduced this year at Dayton by the folks from Starkville. It's intended for use with backpack-portable HF rigs.



SGC's Pierre Goral, KI7UA, shows us the new MAC-200 master antenna controller, a combination switch and tuner for up to five antennas, which remembers and returns to the last setting on each switch position.

tings but also which antenna it's tuning, so the next time you switch to that antenna, it recalls those settings and retunes itself in less than 10 milliseconds. It will handle up to 200 watts power output.

Finally, TimeWave introduced its "Ham Hub" does-it-all digital interface, continuing in the tradition of the PK-232 multimode digital controller.

Books, Books, Books...

Along with the new radios and accessories introduced this year at Dayton, there seem to be more new books being introduced by CQ Communications and others than at any time in recent memory. For a listing, see the CQ website, <www.cq-amateur-radio.com>.

Wrap-Up

Overall, as always, Hamvention was another great ham radio experience. Along with the chance to see and touch new products, attendees get to be part of the world's largest gathering of ham radio operators. There's nothing quite like it anywhere else, on or off the air.

More Dayton photos, including more new equipment, will be found on the CQ website photo gallery. Go to <http://www.cq-amateur-radio.com>, click on "Photo Gallery" at the lower left, then select "Dayton Hamvention 2003."

TECH TALK

Filters: To buy or not to buy?

If there is one particular aspect or trait most radio amateurs have in common, it is seeking out the best possible performance-versus-cost ratio in an HF transceiver. The quest holds good merit, but remember to factor options responsible for that high performance (like IF filters and DSP) into the equation before making a buying decision. Adding optional IF filters (up to seven for competitive model transceivers) noticeably increases overall cost, yet excluding such optional filters shortchanges one's full radio enjoyment. What to do? Go first class right from the start with Icom's world famous IC-756PROII, naturally!

FILTERS, SKIRTS AND DSP. Two of the IC-756PROII's leading assets are its extensive digital IF filters and its 32 bit floating point DSP. Combined, they produce over 50 different built-in filter widths and response curves to mate with operating needs and band conditions of the day. There are no optional filters needed! These DSP-based filters, incidentally, utilize computer-type concepts to clock signals in and out of the processor. Further, Icom's 32 bit DSP can process data with less noise than a 16 bit DSP system. That's why its filter curves can be wide for full-bodied audio yet ultra steep-skirted (only 200Hz difference between its –6 and –60dB points in CW) for incredible selectivity. Crystal filters are good and mechanical filters are better, but neither type compare to Icom's DSP filters. It's that simple!

IC–756PROII

ADDITIONAL CONSIDERATIONS. Using IF filters plays a major role in every transceiver's performance, but they must be supported by additional "high end" circuitry to produce a top-line rig—and this is where Icom's IC-756PROII blows away the competition. Its multiple AGC loops support increased receiver sensitivity with a lower noise floor and permit copying weak signals without desensing or "pumping" from strong adjacent-frequency signals. It is a difference you can hear—and appreciate!

Digital Twin PassBand Tuning further separates the IC-756PROII from the competition. By rotating its concentric controls together, you can move IF response up or down. By rotating them separately (one up, one down), you can narrow a filter's width, and by moving only one control, you can tailor only one side of a response curve. As a result, copying weak stations and rare DX is a cinch with Icom's IC-756PROII. Looking for maximum value in an HF transceiver? Put an IC-756PROII in your shack and start hearing what others are missing!

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BY BOB JOSUWEIT,* WA3PZO

Drills in the Pacific and at Home

In many parts of the country local emergency managers are training their staff to be prepared for severe weather or other disasters, whether natural or manmade. It could be a heavy thunderstorm, a tornado, a hurricane, or a terrorist incident. This month we'll take a look at how our neighbors in the Pacific practice in case their services are needed. Also, we'll look at ham participation in the nationwide TOPOFF2 exercise, and what can happen when some of us behave unprofessionally, even off the air.

Participate

Whether you are new to amateur radio public-service communications or have been involved for some time, it is always good to participate in drills and exercises. One of the keys to a successful exercise is to have an organized plan with a purpose. ARRL District Emergency Coordinator Tim Hayes, NHØH, in Saipan (about 100 miles north of Guam) faced some problems that may seem unique to the western Pacific, but that also need to be addressed in many large cities in the U.S.

The problems include the lack of a common primary language, lack of money, and agency recognition. English is not the primary language in Saipan. Local agencies are staffed primarily by Chamorros or Carolinians, who have their own languages. The Amateur Radio Emergency Service (ARES) volunteers are mostly Filipino contract workers who speak Tagalog as their primary language. Fortunately, everyone does speak English as a second language. Hayes, a native of the continental U.S., commented that English is also *his* second language, since American is his primary!

Hayes told *CQ* that the wages in Saipan are very low, and most hams there count themselves lucky to own a 20-year-old 2 meter handheld. Agencies such as the Red Cross and Emergency Management are similarly handicapped. Then there is the lack of recognition. "The local agencies had never heard of amateur radio," said Hayes, "let alone ARES, when the group was formed two years ago. We are still trying to educate them."

The ARES unit has practiced staffing the typhoon shelters and, according to Hayes, has "gotten pretty good at it." The drill he described for *CQ* focused on damage assessment and used Echolink for the first time in a drill. Several messages were passed through the Pacific Islands Disaster Net on 20 meters. Other objectives were also tested. These included training in damage assessment, practicing net procedures, practicing handling of formal message traffic for served agencies, and testing the off-island link via the Pacific Inter Island Net.

Weather problems on drill day forced ARES officials to scale back some activities, figuring it was better to be safe since this was only a drill. However, the group got together and held a tabletop exercise. They practiced formal traffic handling, which included formatting messages and passing them to the receiving operator in the room. In addition, they originated several messages on HF nets.

Each team originated three damage reports to its group leader. The drill guidelines said the messages could report anything from a road washout to a collapsed building or a power line or tree down

*c/o CQ magazine
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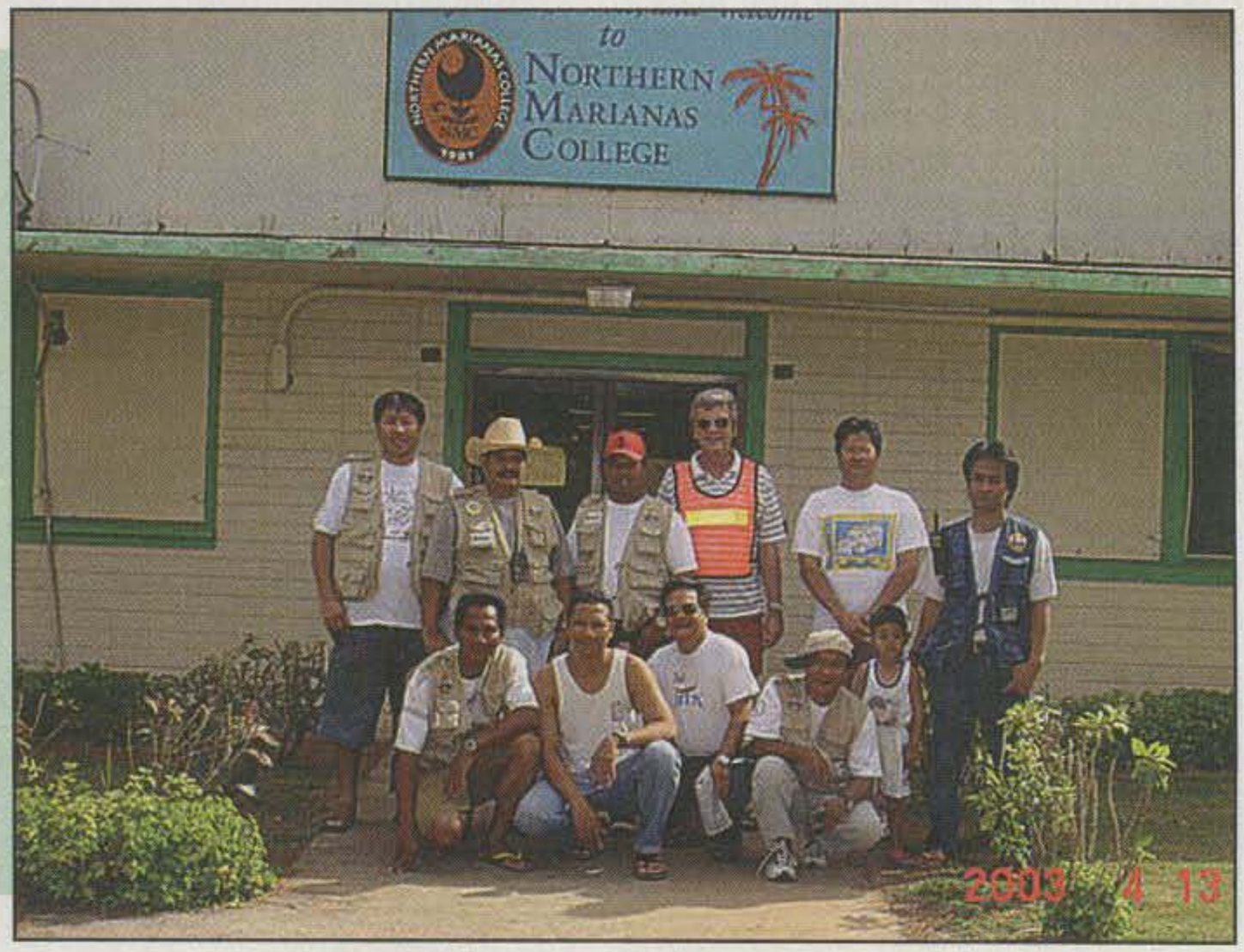

Saipan ARES operators, all members of the MDX Amateur Radio Club, train regularly in all forms of emergency communications. (Photo courtesy Bong Malasarte, WHØX)

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and blocking the road. As with any exercise, the statement "this is a drill" was included with all messages.

Hayes planned an exercise that was simple but had many key elements that would be an important part of any emergency preparedness exercise involving damage assessment. Operators were split up into four separate groups, including the Command Post and three assessment groups. The Command Post group included the District Emergency Coordinator, the Assistant Emergency Coordinators, and two net control operators. The remaining drill participants were divided into three approximately equal assessment groups with a group leader for each group.

Communications were going to be divided between two frequencies, a simplex frequency for the group members doing the damage assessment and a repeater frequency for communications back to the Command Post. Various methods of radio assignments were tried. One was a single operator handling communications on both frequencies. The other was a group operator coordinating the local communication and the group leader to maintain communications with the Command Post.

Each group leader assigned a route that the damage assessment teams should take to make sure that a thorough inspection would be done. One item to keep in mind during a disaster involving high winds is that street signs may no longer exist. It may be very difficult to send an operator to Front and Main Streets when there is no street sign or buildings have suffered significant damage. The assessment teams reported frequently to their group leaders. Hayes said the hams gave their locations and a running commentary on what they saw. While training suggests keeping messages short and to the point, in this case the descriptions helped individuals focus on their surroundings. For example, instead of just describing a damaged home, the operator could be asked to look for downed wires or a broken pipe. These reports were summarized and reported back to the Command Post.

Take another look at the drill plans for our fellow hams in the western Pacific and see if you can pick up any hints for a similar exercise where you live.

Dave Hartnett, KC7HNV (left), and George Planic, W9GWP (right), at the medication dispensing site. (Photo courtesy Joel Nelson, K4JUM)

Daniel Ravans, KC9CKU (left), and Dave Hartnett, KC7HNV (right), at the dispensing center. This was Daniel's first hands-on training under fire. (Photo courtesy Judie Zacharais, N9MA)

TOPOFF2

Amateur radio operators from across the country participated in the national week-long TOPOFF2 Exercise. The much publicized bioterrorism drill centered in the Seattle, Washington and Chicago, Illinois areas. However, local exercises extended into Pennsylvania. In Seattle 55 amateur radio operators participated in the exercise.

As part of the Chicago regional bioterrorism exercise, the Lake County, Illinois Radio Amateur Civil Emergency Service/Amateur Radio Emergency Service (RACES/ARES) responded to the County Health Department's request for communications assistance.

In Illinois the local scenario called for terrorists to attack by spreading the pneumonic plague, a highly communicable and lethal bacterial disease that can cause fever, chest pain, vomiting, and other symptoms. The simulated release of the bacteria occurred at the United Center sports complex, Union Station, and O'Hare Airport on Saturday when a Canadian team was visiting. In this scenario the "infection" spread throughout the area.

Three days later yellow-T-shirt-clad, role-playing victims began overloading local hospitals with flu-like symptoms. This caused the Centers for Disease Control (CDC) to respond and identify the agent as the pneumonic plague. After quickly identifying the agent, the State Health Department was notified and its Emergency Response Plan was implemented. This involved distribution of the Strategic National Stockpile (SNS) of medication to be delivered to infected areas.

As the Lake County Illinois Emergency Operation Center (EOC) began operations, Lake County RACES/ARES was also activated, according to group Secretary David Hartnett, KC7HNV. Members manned the communications center and were assigned to the SNS drop site, where a state- police-escorted convoy arrived with pallets of medication to be distributed in the county. Lake County Sheriff's officers supplied security for both the drop site and the distribution site.

"The EOC was then able to track the supply convoy to the distribution site via Automatic Position Reporting System (APRS) located in a RACES volunteer vehicle which was part of the sheriff's convoy," said Hartnett. "At the distribution center the RACES/ARES group provided both a digital packet station and a voice communications link to the EOC communications center. Both voice and packet messages were passed between the Health Department Site Director and the

County Emergency Coordinator, as well as the County Health Department representative located in the EOC operations command center."

Murphy's Law. *CQ* asked about some of the lessons learned from the drill. "You can never depend on a coax cable that used to work," said Hartnett. "[Cables] need to be checked on a regular basis. Your deployment equipment should be set up regularly with different lengths of coax cables that would be deployed and verify communications, not just that SWR is lower than 2 to 1." Another point was that training on official-type message handling is a must, with lots of hands-on practice sending and receiving that traffic.

Hartnett was pleased with the group's overall performance. He said many members can apply the lessons learned when they participate in different community-service events which are also used as training events.

Military Hams Worked Together. As the drill progressed during the week, Pennsylvania U.S. Army MARS (Military Affiliate Radio System) tested the availability of local amateurs to help with exercise "Bug Off," which was part of the national TOPOFF 2 exercise. The MARS unit contacted Montgomery County Radio Officer Bob Lees, W3ZQN, to activate the RACES alert system to see who would be available at a moment's notice. Over 20 RACES members answered the call in a short period of time. Andrew Shecktor, AAT3JF, PA U.S. Army MARS, said "Mutual aid with RACES/ARES and other organizations is crucial to U.S. Army MARS and homeland security, and would be vital in the event of a local, regional, or national emergency."

This past spring U.S. Army MARS tested its readiness just when many amateurs were already busy providing disaster communications. Last month we reported on tornadoes striking at alarming rates around the country. Let's add to the severe weather conditions well-organized terrorist attacks on storm-battered population centers. While this was only a drill, it could happen. MARS members west of the Ohio Valley had a mission to replace broken commercial communications links and funnel information on the developing "crisis" to relief agencies and the Pentagon.

To the east, Bill Sexton, N1IN, of Army MARS reports that a separate exercise simulated the effect of a terrorist attack on the commercial long-distance telephone and internet systems and regional power grids. The drill provided much useful information to MARS headquarters and homeland security planners.

These exercises, as well as others taking place over the summer, are important, as many reserve Signal Units are deployed overseas. Sexton said there is thus a potentially greater need for the amateur operators' service in a homeland emergency.

(During the first Gulf War, amateurs were called out in large numbers to help support the National Disaster Medical System. In the Philadelphia area, for example, amateurs were asked to be available to assist with tracking patients being brought to the area. At the time, military planners thought that those assigned to duty in the United States would be sent overseas and there would be a need for others to fill in with critical patient-tracking skills.)

In the "Bugoff" exercise Army MARS Western Area Coordinator James Banks reported that simulated terrorist attacks were directed at some 29 states, including "terrorist attacks on major highways and Interstates, rivers, bomb explosions at airports, chemical spraying, and vehicle theft." MARS members in the affected areas had to submit "Essential Elements of Information" of what was happening.

Eastern Area Coordinator Robert Hollister said, "Most message handling was done through the MARS digital and voice networks." He noted "significant improvement" in participation over last year.

"With members resident in or near virtually every county in the country," noted Sexton, "the MARS organization is well equipped to serve as the Defense Department's early-warning system for domestic emergencies."

DHS and The ARRL Pledge Mutual Support

The American Radio Relay League and the U.S. Department of Homeland Security signed an important *Statement of Affiliation* this past June. According to the ARRL, both organizations "view community disaster preparedness and response as top priorities." They pledged mutual support for the Citizen Corps—a community-based training and outreach initiative that brings together volunteers and first responders.

"This is all part of the bigger picture of getting emergency communications aligned with what our government needs," said ARRL President Jim

EMCOMM Manager's Reference

There are many people I've come to admire in 30+ years of amateur radio public service. Clearly, one of the masters of amateur radio public service is Jerry Boyd, KW7J. Having served with Jerry on the ARRL Public Service and Emergency Communications Advisory Committees for many years, you simply know when you're working with one of the best. Boyd brings a unique background to amateur radio public service, having served as a police chief and in many ARRL volunteer positions.

Boyd shares his experience in emergency management with other amateurs who have volunteered to serve in various emergency communications leadership positions. His new book, *Management of the Amateur Radio Emergency Communications Function,* fills a gap that is not covered in the ARRL EMCOMM courses. The ARRL courses were not designed to be an "in-depth management course." Boyd says his purpose is to provide EMCOMM managers and leaders "with important information that will help them develop or refine their leadership and management skills."

Many EMCOMM leaders do not come from a management background. They quickly find out that running a successful organization is a lot different from serving as a radio operator in the field.

Boyd helps address those needs by talking about recruiting volunteers, insurance issues, motivation, staffing needs, effective planning, working with served agencies, and conducting evaluations.

Boyd points out that an EMCOMM manager can't simply have an attitude of "I'm just a volunteer." County Emergency Managers are relying on you and your organization to provide critical, if not life-saving, communications. You need to do your job professionally. Whether you are a volunteer or a paid professional responsible for managing a group, you need to be able to handle all of the tasks required of you.

Management of the Amateur Radio Emergency Communications Function gets right to the point. It's a good reference book for those who may not be managing every day, but who need a reminder of how to handle a particular situation. It's an important tool in the EMCOMM manager's office.

Management of the Amateur Radio Emergency Communications Function is published by Worldradio Books. Cover price is $8.00.

Haynie, W5JBP. "Amateur Radio stands ready to serve the country as needed in times of emergency." Programs under the Citizen Corps are aimed at helping communities prevent, prepare for, and respond to terrorism, public health issues, and disasters.

Professionalism

At the very beginning I commented that we need to be *professional* all the time. There are many amateur radio public-service-related e-mail lists on which hams can share their experience and ask questions. Many of these lists have open membership and anyone can sign up and participate. It's never known whether you're a ham, a reporter, a person involved with emergency management, or someone with less than ethical intentions.

In a case that came to my attention, a local government emergency manager began monitoring one particular list to learn more about the work of amateur radio in an emergency. He and his town were considering asking the local hams to participate in their plans, but he wanted to get a little insight before he extended an offer. One night a few "flames" began to be exchanged between several members of the list. After watching the messages go by, the emergency manager simply had enough. Several EMT professionals and I contacted this person. Unfortunately, it was too late. The damage had been done, and by individuals who lived hundreds of miles away.

Thus, just like when you're on the air, next time you post a message on an e-mail list, think about who might be monitoring and how your words might affect their perception of amateur radio.

In Closing . . .

This month we've covered the importance of participating in drills and exercises amid the emphasis being placed on the role amateur radio operators can play in these days of concern about homeland security. We would like to thank NHØH, KC7HNV, N1IN, and W3ZQN for their input.

Do you have an interesting story to tell? Please drop me a note. Until next month . . .

73, Bob, WA3PZO

MARS is Active in Iraq and Afghanistan

MARS, the Military Affiliate Radio System, is well known for passing thousands of messages between our deployed troops and their families back home during Vietnam and the Gulf War. In June the first MARS licenses were issued to soldier stations in Iraq and Kuwait. MARS is also operational in Afghanistan. These new operations will make MARSgrams and phone patches available to nearly every company-size unit, including many who are beyond the reach of e-mail and cell phones. Daniel Wolff, assistant affiliate MARS coordinator for Europe, Africa, and southwest Asia, reported that four soldier licenses had been issued as of June 1, but he hopes there will be many more as active hostilities wind down.

While morale traffic is no longer MARS's primary mission, it is still important. Bill Sexton, N1IN, reports that there is a shortage of stations available to receive the messages overseas. Sexton says many MARSgrams are being sent to the gateway stations near Iraq or Kuwait and then placed in the Military Postal System for delivery to their final address. This reduces the amount of time it would take to deliver a letter mailed from the United States. Information on sending MARSgrams is available at <http://www.netcom.army.mil/MARS>.

"Now that most hostile actions have stopped in the region, humanitarian and other support roles will be employed," said Wolff. "MARS should be one of them. But if we are going to see MARSgrams and phone patches flowing in and out of southwest Asia then we need to see more MARS stations in the region.

"I suspect that more would request a license, including hundreds of deployed ham operators, if they knew how to reach us. The reality is, they probably don't even know that MARS is an option for them. How sad."

FCC-licensed amateurs apply for an overseas MARS license much as they would in the United States, except that additional information is required (i.e., latitude and longitude of the station) for operations in foreign countries. Commanding officers may also apply for a MARS station license for their unit and are exempt from the FCC amateur radio license requirement.

Commanders or ham operators deployed, or expected to deploy, may obtain full information and application forms at <aem1wf@qsl.net> (all lower case!).

Information courtesy of Bill Sexton, N1IN

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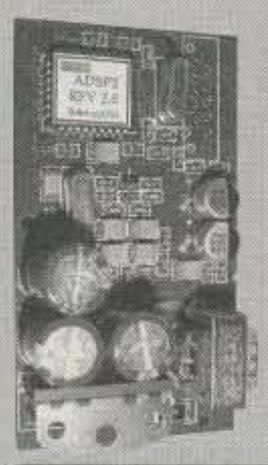

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Reader Survey
August 2003

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Survey Card and returning it to us. As a bit of an incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

This month we'd like to gauge your plans regarding the new 5-MHz/60-meter band.

Please indicate... **Circle Survey Card #**

1. ... whether you are aware of the details regarding the new amateur allocation at 5 MHz:
   - Yes....1
   - No....2
   - Not sure....3

If you answered "no" or "not sure," read WB6NOA's "Getting Ready for 60" article and W5YI's "Washington Readout" column in this issue.

2. ... whether you plan to operate on 5 MHz within the next three years:
   - Yes....4
   - No....5
   - Maybe....6

3. ... whether your current license will allow you to operate on 5 MHz (General or above required):
   - Yes....7
   - No....8
   - Not licensed....9

4. ... whether your current HF equipment is upgradeable to operate on 5 MHz (see Table II in WB6NOA's article):
   - Yes....10
   - No....11
   - Not sure....12

Please answer question 5a or 5b only, not both.

5a. ... *IF you answered YES to question 3,* whether you plan to make the modifications necessary to operate on 5 MHz.
   - Yes....13
   - No....14
   - Not sure....15

5b. ... *IF you answered NO or NOT SURE to question 3,* whether you plan to purchase a new radio that operates on 5 MHz:
   - Yes....16
   - No....17
   - Not sure....18

6. ... whether operation on 5 MHz will be a factor in your next HF radio purchase:
   - Yes....19
   - No....20
   - Not sure....21

7. ... whether operation on 5 MHz will be a factor in your next HF antenna project or purchase.
   - Yes....22
   - No....23
   - Not sure....24

8. ... which phrase most closely matches your feelings about the FCC's 5 MHz ruling:
   - I have no problem with the structure of the 5 MHz band....25
   - It's too bad we couldn't get a regular band here, but we'll take what we can get....26
   - The restrictions placed on this band will discourage most people from operating on it....27
   - The restrictions placed on this band will discourage ME from operating on it....28
   - The restrictions placed on this band are an insult to the ability of hams to coexist with other radio services on shared frequencies....29
   - I have no interest in operating on 5 MHz so it doesn't really matter to me....30

Thank you for your responses. We'll be back with more questions next month.

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BY FREDERICK O. MAIA,* W5YI

FCC Issues Order on Low-Frequency, 5 MHz, and 2.4 GHz Ham Bands

Declines to grant LF allocation; gives five channels at 5 MHz, ...makes 2400–2402 MHz Primary

Between 1998 and 2001 the American Radio Relay League filed three Petitions for Rulemaking with the FCC requesting new amateur allocations at LF and HF and a status upgrade on part of a UHF band. The FCC lumped the three petitions together in a May 2, 2002 Notice of Proposed Rulemaking (NPRM). On May 14, 2003 the FCC released a final *Report and Order* in ET Docket No. 02-98. The R&O addressed new ham bands at 136 kHz and 5 MHz and a change in allocation status at 2400–2402 MHz.

The final FCC action was quite different from that requested by the ARRL ...and even from what the Commission had proposed earlier!

Three Requests Combined

The first of these petitions (RM-9404, filed October 22, 1998) requested that a secondary allocation to the Amateur Service be made in the 135.7– 137.8 kHz and 160–190 kHz bands to permit experimentation in the LF frequency range. The second petition (RM-9949, filed July 17, 2000) requested an upgrade to primary status for the existing secondary 13 cm amateur allocation and a new primary allocation for the Amateur-Satellite Service in the 2400–2402 MHz band to protect existing amateur operations from future commercial systems that may utilize the band. The third petition (RM-10209, filed August 13, 2001) requested a secondary 150 kHz wide amateur allocation in the 5 MHz (60 meter) band to enhance amateur emergency communications and experimentation when propagation conditions are not favorable in the 3500 kHz (80 meter) and 7000 kHz (40 meter) bands.

In its NPRM the FCC proposed granting a secondary Amateur Service allocation at 135.7–137.8 kHz (but not 160–190 kHz) and granting the ARRL's requests at both 5 MHz and 2.4 GHz. After considering comments from power companies that strongly believed an amateur allocation at 135 kHz would disrupt power-line communications (PLC) used by electrical utilities to control the power grid, and objections to the 5 MHz request from the National Telecommunication and Information Administration (NTIA), the FCC's counterpart on federal government frequency allocations, the Commission decided against any new amateur LF allocation and severely limited the allocation at 5 MHz. The 150 kHz wide requested (and FCC proposed) 5 MHz ham band became five low-power discrete 2.8 kHz wide USB voice channels at 5332, 5348, 5368, 5373, and 5405 kHz.

The FCC did agree, however, to elevate the Amateur Service, but not the Amateur-Satellite Service, to primary status at 2400 to 2402 MHz. The changes went into effect on July 3, 2003. The 26-page Report and Order is available on the FCC website at: <http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-105A1.doc>. Here are the details:

*National Volunteer Examiner Coordinator,
P.O. Box 565101, Dallas, TX 75356-5101
(telephone 817-461-6443)
e-mail: <w5yi@cq-amateur-radio.com>

135.7–137.8 kHz and 160–190 kHz Bands

Background. The bands 130–148.5 and 160– 190 kHz are allocated in the U.S. to both federal and non-federal government users. In addition, the LF spectrum is used by unlicensed devices. These systems do not have any allocation status, but are authorized to operate at up to 1 watt total input power under Part 15 rules on an unprotected, non-interference basis with respect to all other users.

In addition, Section 15.113 permits Power Line Carrier (PLC) systems on power transmission lines for communications important to the reliability and security of electric service to the public in the 10–1490 kHz band. PLC systems are used to trip protection circuits if a fault, such as a downed power line, is detected in the power grid.

In the fall of 1998 the ARRL asked the FCC to create a domestic secondary LF allocation for the Amateur Service at 135.7–137.8 kHz and 160– 190 kHz. The ARRL pointed out that numerous amateurs and other radio operators in the U.S. are already using the 160–190 kHz band under Part 15 rules, but that power and antenna limitations preclude or inhibit effective experimentation. The League asked for more liberal operating conditions, "...such as an output power limit of 200 W peak envelope power (PEP) and 2 W effective isotropic radiated power." Amateurs using LF CW, RTTY, or pulse transmissions can often achieve distances of 100 to 300 miles under favorable propagation conditions. With an allowable power of 5 W ERP they can achieve transcontinental communications.

Regarding sharing with Part 15 PLC operations, the ARRL argued that such operations have no allocation status and thus do not merit protection from services with allocation status. Nevertheless, the ARRL believes that the interference potential of LF amateur operations to PLCs would be minimal.

The ARRL petition pointed out that although there is no international allocation for the Amateur Service in these bands, several European countries are permitting amateurs to operate in the 135.7–137.8 kHz band with 1 W effective radiated power (ERP). LF amateur operation was authorized at 136 kHz on January 30, 1998 in the United Kingdom. Other CEPT countries soon followed. These allocations resulted in the development of LF equipment and transmission systems by radio amateurs. As a result, communication was established between Canada and the U.K. on September 10, 2000 using 1 watt ERP.

The FCC initially agreed with the ARRL in the Notice of Proposed Rulemaking and proposed allocating the 135.7–137.8 kHz band to the Amateur Service on a secondary basis. The Commission indicated that the allocation appeared to be acceptable because the incumbent use of the 135.7– 137.8 kHz band appeared to be very light, and thus a secondary

Amateur Service allocation here would likely raise few interference concerns. The Commission proposed to limit amateur stations operating in the 135.7–137.8 kHz band to an effective isotropically radiated power (EIRP) of 1 W and a transmission bandwidth of 100 Hz.

No restrictions on antenna size or design for amateur stations in this band were proposed, because such restrictions would inhibit experimentation. The FCC also proposed to limit access to this band to amateur operators with General, Advanced, or Amateur Extra Class licenses. "This allocation will allow amateur radio operators the ability to experiment more freely with propagation, antenna design, and antenna construction," the FCC said in the NPRM.

Comments. In general, amateurs supported the creation of a new secondary allocation at 135.7–137.8 kHz and 160–190 kHz. Utility companies, however, were vehemently opposed. They collectively commented that PLC systems are critical to the proper functioning of the national power grid, and amateur operations could cause widespread interference and power outages. Furthermore, many utilities indicated that a new amateur allocation would give hams the right to demand that interference from PLC systems be resolved by the power companies, often at considerable expense.

FCC decision at 136 kHz. The FCC agreed that amateur experimentation in the 135.7–137.8 kHz and 160–190 kHz portions of the LF spectrum could serve to increase the pool of individuals having knowledge of LF transmissions. However, it concluded that such operations would pose the potential for harmful interference to systems protecting and controlling the national power grid.

"In evaluating whether new operations should be added to a band, licensed or not, we must consider the potential for interference conflicts between the operations. While unlicensed PLC operations have no protection status, they provide a vital public service. Therefore, we disagree with amateur comments that we should not consider the impact on unlicensed operations when making spectrum allocation decisions.

"We believe that the utility companies have raised a valid concern that an allocation to the Amateur Service could result in the need for PLCs to modify or cease their operations to avoid causing interference to amateurs."

The FCC said a new amateur LF allocation is not justified "...when balanced against the greater public interest of an interference-free power grid."

"We will not jeopardize the reliability of electrical service to the public," the FCC added. "Accordingly, we decline to make an allocation to the Amateur Service in the

Got Noise?

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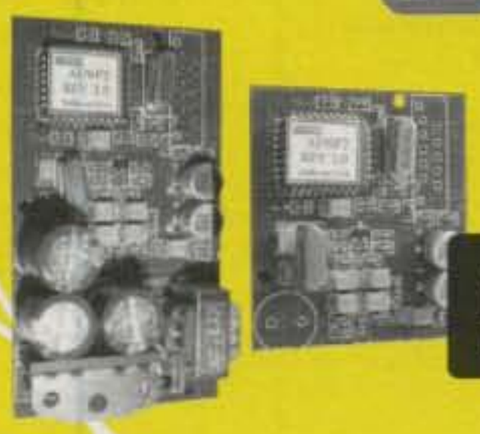

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LF spectrum at this time. Amateurs may still make use of the 160–190 kHz band under our Part 15 rules, which are much more restrictive, and therefore more protective of PLCs, than the limits earlier proposed in the NPRM."

5250–5400 kHz (60 meter) Band

Background. There is currently no international Amateur Service allocation at 5250–5400 kHz. In the United States this band is allocated to the fixed service on a primary basis and is used by the federal government for ship-to-shore and point-to-point communications.

On January 8, 1999 the FCC granted an experimental license to the ARRL for 15 stations to compare communications reliability between the 80, 60, and 40 meter bands.

Two years ago the League filed a Petition for Rule Making (assigned RM-10209) requesting a domestic 5 MHz secondary allocation in the 5250– 5400 kHz band. It said the Amateur Service needed 150 kilohertz of 5 MHz spectrum "...to fill the ionospheric propagation gap" between the propagation paths provided by allocations in the 80 and 40 meter bands. The ARRL contends this "propagation gap" occasionally interrupts emergency communications by amateur radio operators between the U.S. and the Caribbean islands during hurricanes and severe weather disasters. The League said the 1999 experimental operations confirmed that amateur stations can coexist with incumbent operations without causing harmful interference.

The FCC agreed and tentatively concluded that the Amateur Service would benefit from a secondary allocation at 5250–5400 kHz and proposed to establish such an allocation with the power level set at up to 1500 W PEP as requested by ARRL. In making this proposal, the Commission stated that it appears that amateur radio operators should be able to avoid interference to primary operations in this band due to the limited number of primary assignments. In addition, the Commission indicated that the operational protocol of "listen before transmit" employed by amateur radio operators could further minimize interference.

Comments. The FCC received more than 200 comments, mostly from radio amateurs, almost all supporting the new secondary allocation at 5250–5400 kHz.

Many of the commenters supported output power levels between 100–250 W PEP; others recommend the ARRL's proposed 1500 W PEP. Several wanted the band divided according to transmission types. Those opposing "sub- banding" claimed that much of the CW and data sub-bands in other amateur allocations are underutilized, and that many other nations are eliminating their sub-bands.

The United Power Line Council (UPLC) opposed the 5 MHz amateur allocation, since the band is one of a number of frequency bands that may be used to provide high-speed internet service via power-line carrier systems ...also known as BPL, or "Broadband over Power Lines" (see last month's "Washington Readout"). It asked that the Commission defer action until the impact on BPL can be fully assessed.

The Power Line Carrier Association (PLCA) agreed with UPLC's arguments and contended that its members would need to notch out the 5250–5400 kHz band if amateur operations were to be permitted there.

Another commercial group, the Homeplug Powerline Alliance, asked that a "safe harbor" be granted for ten years for consumer equipment currently meeting Part 15 standards. Under the "safe harbor," Part 15 equipment operating in accordance with existing rules would be deemed as not causing interference to licensed services. Homeplug said it had "notched out" all of the other amateur bands. The ARRL said Homeplug's products had caused interference in the past to hams on other HF bands, and objected to the BPL opposition on the grounds that "...no Part 15 manufacturer is entitled to oppose an allocation to a licensed radio service based on future deployment of an unlicensed device."

The biggest objection came from the National Telecommunication and Information Administration, the White House advisor on telecommunications matters, which also handles frequency allocation for federal government users of the RF spectrum. NTIA stated that the 5250–5400 kHz band "...is extensively used by federal agencies, and they need immediate access to these HF frequencies in times of emergency."

To accommodate some amateur operations in this band, NTIA subsequently proposed that five specific frequencies—5332, 5348, 5368, 5373, and 5405 kHz—be made available to the Amateur Service on a secondary basis. NTIA further proposed that the amateur transmissions on these frequencies be limited to upper sideband voice (emission designator 2K8J3E) centered around the above frequencies, and must not exceed the equivalent of 50 W PEP transmitter output power into an antenna with a gain of 0 dBd (50 W ERP). NTIA explained that these limited frequencies and technical limits would permit sharing in this spectrum.

Decision. The FCC agreed that a 5 MHz amateur allocation would be useful for completing disaster communications links and thanked the amateur community for its efforts in this regard.

"At the same time," the Commission wrote, "since the majority of the affected

users are federal government licensees with homeland security responsibilities, we give considerable weight to the concerns NTIA has expressed about the potential for interference to these users. Thus, we conclude that it is not reasonable to grant the ARRL's original request for the whole of the 5250–5400 kHz band."

The FCC noted that NTIA had reviewed its assignments and found five channels that are lightly used and could be used on a secondary basis by amateur stations.

"While we recognize that these five channels will not give the Amateur Service the 150 kilohertz of spectrum in the 5000 kHz range it originally asked for or the flexibility to use multiple transmission modes, this appears to be the best compromise available to give the Amateur Service access to new spectrum while assuring the federal government agencies that their use is protected.

"Accordingly, we are amending our rules to provide a secondary allocation to the Amateur Service on the channels 5332 kHz, 5348 kHz, 5368 kHz, 5373 kHz, and 5405 kHz as specified by NTIA, and to require that amateur operations be limited to an effective radiated power (ERP) of 50 W, and emission type 2K8J3E, upper sideband voice transmission only centered on each frequency.

"For the purpose of computing e.r.p. the transmitter peak envelope power will be multiplied with the antenna gain relative to a dipole or the equivalent calculation in decibels. A half wave dipole antenna will be presumed to have a gain of 0 dBd. Licensees using other antennas must maintain in their station records either manufacturer data on the antenna gain or calculations of the antenna gain."

As originally proposed, the FCC approved the use of these channels by General, Advanced, and Amateur Extra Class licensees.

The FCC denied the UPLC and PLCA request to delay action on allocating the band, as well as Homeplug's request for a ten-year safe harbor.

2400–2402 MHz (13 cm) Band

Background. Internationally, in all three ITU Regions the 2300– 2450 MHz band is allocated on a secondary basis to the Amateur Service. The primary allocation is to the Fixed, Mobile, and Radiolocation (radar) Services for both government and non-government use. The U.S. Federal Government allocation is used, to a limited extent, by the military for intelligence gathering.

Further, in all three ITU Regions, industrial, scientific, and medical (Part 18 "ISM") devices operate in the 2400– 2500 MHz band, and all radio services must accept interference caused by ISM devices. ISM devices are equipment or applications designed to generate and use RF energy for industrial, scientific, medical, domestic, or similar purposes, excluding applications in the field of telecommunications.

The Amateur-Satellite Service is also permitted in the 2400–2450 MHz band in all ITU regions on a non-harmful interference basis, and all countries must ensure that any harmful interference created by amateur-satellite operations is eliminated.

In the U.S. unlicensed Part 15 transmitting devices are permitted in the 2400–2483 MHz band on a non-harmful interference basis. These devices are used for a variety of operations including cordless phones, wireless local area networks, and other broadband wireless applications using industry standards protocols such as IEEE 802.11b (so-called "Wi-Fi," wireless fidelity internet access) and "Bluetooth," another short-range radio networking technology.

Prior to August 10, 1995 the 2400–2402 MHz band was allocated domestically to federal government radiolocation operations on a primary basis and to the Amateur Service on a secondary basis with amateur-satellite operations permitted on a non-harmful interference basis.

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However, the Omnibus Budget Reconciliation Act of 1993 (OBRA- 93) identified the 2390–2417 MHz band for transfer from shared use to exclusive non-federal government use spectrum.

On November 18, 1999 an FCC Policy Statement concluded that the 2400–2402 MHz band should be placed into a spectrum reserve for future applications. Specifically, the Commission said the band would be reserved until new technologies or other changes would increase the opportunity for new operations and that the FCC would be receptive to petitions for reallocation of the reserved bands.

In response to the Policy Statement the ARRL filed a Petition for Rule Making in mid-2000 requesting that the FCC upgrade the domestic Amateur Service allocation in the 2400–2402 MHz band from secondary to primary status and add a primary allocation for the Amateur-Satellite Service. The ARRL said that such an action would ensure continued unfettered access to the 2400–2402 MHz band by the Amateur Service. In support of its request, the League argued that a primary Amateur Service allocation would protect its operations from reallocation or use by an incompatible sharing partner. The League said that primary allocation status in this range would sustain the overwhelming costs and dedication of time and effort required to keep the amateur-satellite program flourishing, and provide some assurances of future occupancy of the band for the next generation of amateur satellites.

In the NPRM the FCC said it believed that "...ARRL's request to upgrade the allocation status of the Amateur and Amateur-Satellite Services in the 2400–2402 MHz band has merit. Further, we acknowledge the Amateur Service community's position that it has invested time, effort, and money in the development of the Amateur and Amateur-Satellite Services and primary allocations in this band would protect this investment from future allocation requests in the band.

"Similarly, this band is extensively used by unlicensed operations, which have been able to share with amateur radio station use to this point. Because this band is important to unlicensed applications and there is widespread deployment, the removal of such devices would not be feasible."

Comments. The ARRL, Radio Amateur Satellite Corporation (AMSAT), and other amateur radio operators overwhelmingly supported the ARRL/FCC proposals for the 2400–2402 MHz band.

The ARRL stated that the proposed change would protect existing Amateur-Satellite Service operations and provide some assurance of the future availability of this spectrum.

AMSAT added that allocating frequencies at the edge of the ISM band would create a reasonable sharing opportunity for amateurs. AMSAT further pointed out that it expects a technical challenge in dealing with interference from co-located ISM devices such as microwave ovens found in most residences, but that residential operation is intermittent, which should minimize occurrences of interference.

The Amateur Radio Research and Development Corporation (AMRAD) agreed that the proposed allocation actions would encourage increasing use and investment in amateur satellites.

Both the ARRL and CQ Communications were concerned that the proposal as set forth in the NPRM appeared to imply that unlicensed users may have priority over licensed users of this band. CQ argued that licensed services should always have priority over unlicensed operations on the use of the bands involved and it is concerned that the Commission "...appears to be placing the needs of unlicensed services on a par with those of licensed services."

The ARRL stated that "...the Amateur Service now has status in the 2400– 2402 MHz band and the apparent concern that this proposed allocation change will conflict with Part 15 devices is illogical because Part 15 devices operate without any allocation status and cannot operate when they cause interference to any licensed station."

The IEEE Local and Metropolitan Area Networks Standards Committee (IEEE 802) opposed the proposed primary allocation of the 2400–2402 MHz band for amateur and amateur-satellite use. It said it was concerned that if the proposed amateur allocations were made, the ARRL would attempt to use the new amateur primary status to raise challenges to Part 15 unlicensed operation in the 2400–2402 MHz band.

IEEE 802 suggested that sharing with Part 15 devices could be facilitated by limiting the amateur-satellite operations to the Space-to-Earth direction, as is done on the AMSAT-OSCAR-40 satellite, because aggregate interference from other users in the band could increase the possibility of interference to sensitive receivers on board the satellites. IEEE 802 also requested that the FCC establish a "safe harbor" for Part 15 devices in the 2400–2402 MHz band similar to that created at 902 MHz. Under this approach a Part 15 device would, by definition, not be considered to be causing interference if it operated in accordance with the Part 15 rules.

The ARRL opposed IEEE 802's "safe harbor" proposal, calling it "...unnecessary because individual Part 15 devices cannot continue to operate where interference is caused to any licensed station." The League also did not agree that the amateur-satellite allocation should be limited to the downlink direction only, because it said that failed to consider the existing and future satellite operation in this band.

Decision. The FCC upgraded the existing Amateur Service (but not the Amateur-Satellite Service) allocation at 2400–2402 MHz from secondary to primary status. This modification will provide additional protection to the Amateur Service in this band from future licensed operations, the FCC said.

"The allocation changes we are making will not alter the interference protection rights among the current users of the band. Even under the current secondary allocation, Amateur Services are entitled to interference protection from Part 15 devices, and ISM devices are entitled to protection from both amateur operations and Part 15 devices. These relationships will remain the same under the Amateur Service primary allocation."

The Commission observed that "...the amateur operators have successfully shared this band with Part 15 and Part 18 operations and we have no reason to believe that this sharing will not continue

"W5YI Report" QRT

For the past 25 years Fred Maia, W5YI, has been publishing his own twice-a-month newsletter, the "W5YI Report." Three years ago he sold his company, and with it the "W5YI Report" newsletter. Fred did agree, however, to continue providing the newsletter for three years, until the July 15, 2003 issue. After that newsletter subscriptions will be fulfilled with *CQ* magazine, beginning with this issue.

The newsletter started in the late 1970s as input to a ham radio club, the Richardson (Texas) Wireless Klub. Others asked for it, so Fred made it available to them on a no-cost basis. All he asked for was a batch of numbered, stamped, self-addressed envelopes which he filed in reverse order in 24 cardboard boxes in his garage—one for each issue over a yearly basis. As the envelope count got down to one or two, he told his readers to send another batch. The system soon got out of hand, and Fred had thousands of envelopes in his crude distribution system. It was then that he was forced to change to a paid-subscription basis and began printing (instead of photocopying) the newsletter.

Fred, now 68, wants to retire from the twice-a-month grind of writing the newsletter. He will continue, however, to write his monthly column in *CQ* magazine.

to be successful. Part 15 devices are limited in power and this interference potential from them is limited to an area very close to their transmit location. We therefore modify our Rules to provide a primary allocation for the Amateur Service (except Amateur-Satellite Service), consistent with our decision here."

The FCC stated their analysis regarding an Amateur-Satellite Service allocation at 2400–2402 MHz differs from the case of terrestrial use in this band: "The Amateur-Satellite Service currently operates on a non-interference basis to other services under an international footnote and not on a secondary basis as some parties suggest. This means that these operations are on an equal footing with Part 15 devices. As both the amateur and unlicensed proponents recognize, the sensitivity of amateur satellite receivers makes them more vulnerable to aggregate interference from other users in this band. The 2400– 2402 MHz band is heavily used by both Part 15 and Part 18 devices, and, unlike terrestrial amateur operations, amateur satellite receivers are at greater risk from aggregate interference.

"We thus conclude that an allocation for the Amateur-Satellite Service would be impractical and difficult to implement, given the protection status afforded ISM devices and the large number of Part 15 devices that operate in the band."

The Commission agreed with the ARRL that unlicensed users do not have protection rights over licensed users in a band. However, it said the League "... is incorrect when it asserts that we need not consider unlicensed use of this band when deciding whether to modify the allocation. The issue here is whether different uses are compatible and promote efficient use of spectrum. This analysis requires that we consider both licensed and unlicensed use.

"We conclude that, in the 2400–2402 MHz band, the status quo provides the best mix of uses to promote spectrum efficiency," the Report and Order continued. "The extensive use of the band to date by Part 15, Part 18, and amateur users under the existing rules supports this conclusion.

"We also conclude that, because we are maintaining the relative allocation status in this band, it is not necessary to implement a 'safe harbor' for Part 15 devices. Unlicensed devices operated in accordance with the Part 15 rules should not cause interference to the Amateur Service, and amateur services can take into account the well known technical characteristics used by unlicensed devices as they operate in the band."

The FCC concluded, "The Amateur Service and unlicensed devices have successfully shared this band in the past, and we have no reason to conclude that these sharing arrangements will not continue to be successful.

The More Things Change...

There's an old saying, "the more things change, the more they stay the same," and that certainly seems to be the case here. The culmination of five years of Petitions for Rule Making, a Notice of Proposed Rule Making, comments, reply comments, and finally, a Report and Order is no change (and no allocation) on LF; a change that really makes no change at 2.4 GHz; and a new allocation at 5 MHz that has so many restrictions it wouldn't be surprising if very few amateurs go to the trouble of investing in radios and antennas to operate there. (For those who are interested, see WB6NOA's guide to getting on the 60 meter band elsewhere in this issue.) Only time will tell.

73, Fred, W5YI

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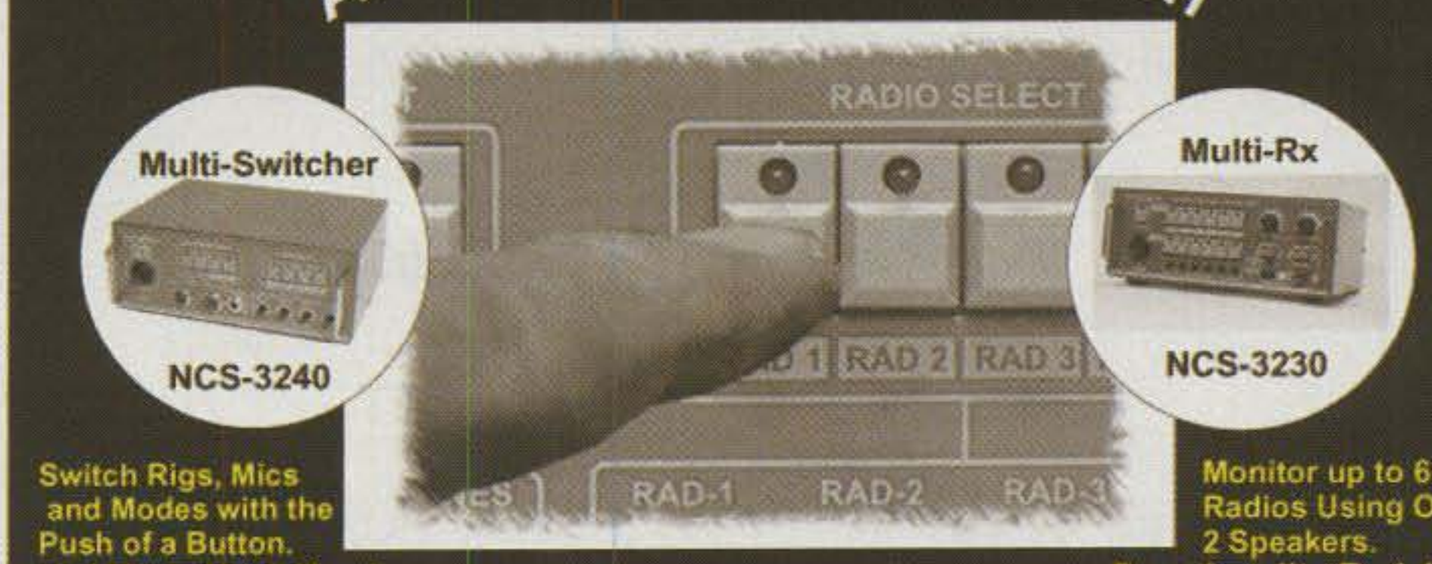

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math's notes

BY IRWIN MATH,* WA2NDM

The LTC1799—A Versatile Oscillator

A while ago we mentioned a fairly new chip available from Linear Technology that purports to be a replacement for LC-type oscillators. Since that time we have had a chance to actually use this part in a product we manufacture, and I would like to give you a first-hand idea of what the LTC1799 can really do.

First some background. The LTC1799 is a surface-mount device that comes in a modified SOT-23 package which, believe me, is very, very small. In fact, you had better get out the old tweezers, the one with the tiny points! The oscillator operates from 1 kHz to 30 MHz in several ranges and only requires one external resistor and one external capacitor (a bypass) for operation. The manufacturer claims that short-term stability is on the order of .004% per degree Centigrade, and long-term stability is 300 ppm per thousand hours. While not exactly crystal stability, it certainly is better than many of the simple LC circuits we have built in the past (especially over wide temperature ranges). Actually, our use for the device was as a clock source (instead of a crystal oscillator) in a multiplexer design, and results were quite satisfactory.

Fig. 1 is a schematic of the basic-application circuit, and believe it or not, that is all you need! The unit operates by dividing an internal oscillator by a factor of 1, 10, or 100 as determined by the setting of the switch connected to pin 4. In actual operation this switch is replaced by a jumper that can connect to Vcc, ground, or left open, depending on the final frequency range desired. The exact output frequency is then chosen by selecting the value of R_{set} in accordance with the following:

$$F = 10\ MHz \times N\ (10K/N \times R_{set})$$

where N is 1, 10, or 100, as discussed. R_{set} can be any value between 5K and 200K.

If you build the circuit shown in fig. 1, you will get a nice 5 volt square wave at pin 5 into any load of 5K ohms or more. However, if you need to drive a lower impedance, a simple emitter follower can easily be added. A 10 MHz oscillator we built, by the way, had a rise and fall time of only 15 nsec with very little ripple on the flat portion of the waveform. One should keep in mind, however, that the output is a square wave, and as a result will produce many harmonics. If a sine wave is what you want, you can either drive a simple tuned stage as shown in fig. 2 or a low-pass filter as shown in fig. 3.

The L and C in fig. 2 should be calculated for the frequency desired, and the values given in fig. 3 can serve as a starting point for 10 MHz. You might even be able to use a common 10.7 MHz FM radio IF transformer if you want a transformer coupled output. We have tried both methods and both work. The low-pass filter method, however, will result in a loss of signal amplitude.

Since the oscillation frequency is a function of the current flowing into pin 3, you can even FM modulate the LTC1799 as shown in fig. 4. We have tried this with limited success over the voice range of 300 Hz to 3 kHz, and linearity was not perfect but certainly seemed okay for communications purposes. Incidentally, you set the degree of modulation (deviation) by the amplitude of the input audio. It is even possible to construct a VCO by varying the current flowing into pin 3 if you wish, but I will leave the details of that endeavor up to you.

Whatever application you choose, the final results can be made very small and compact, so choose your components with care and please let us know what you come up with.

Before we close for this month, we would like to mention a college-level course being offered by Queensborough Community College in New York in the fall. It pertains to laser and fiber-optic technology that may be of interest to some of our readers. This course is an excellent, sophisticated, hands-on introduction to the technology and will be available via distance learning (complete with remote- controlled labs) on the internet. Although there are pre-requisites, I can personally vouch that

*c/o CQ magazine

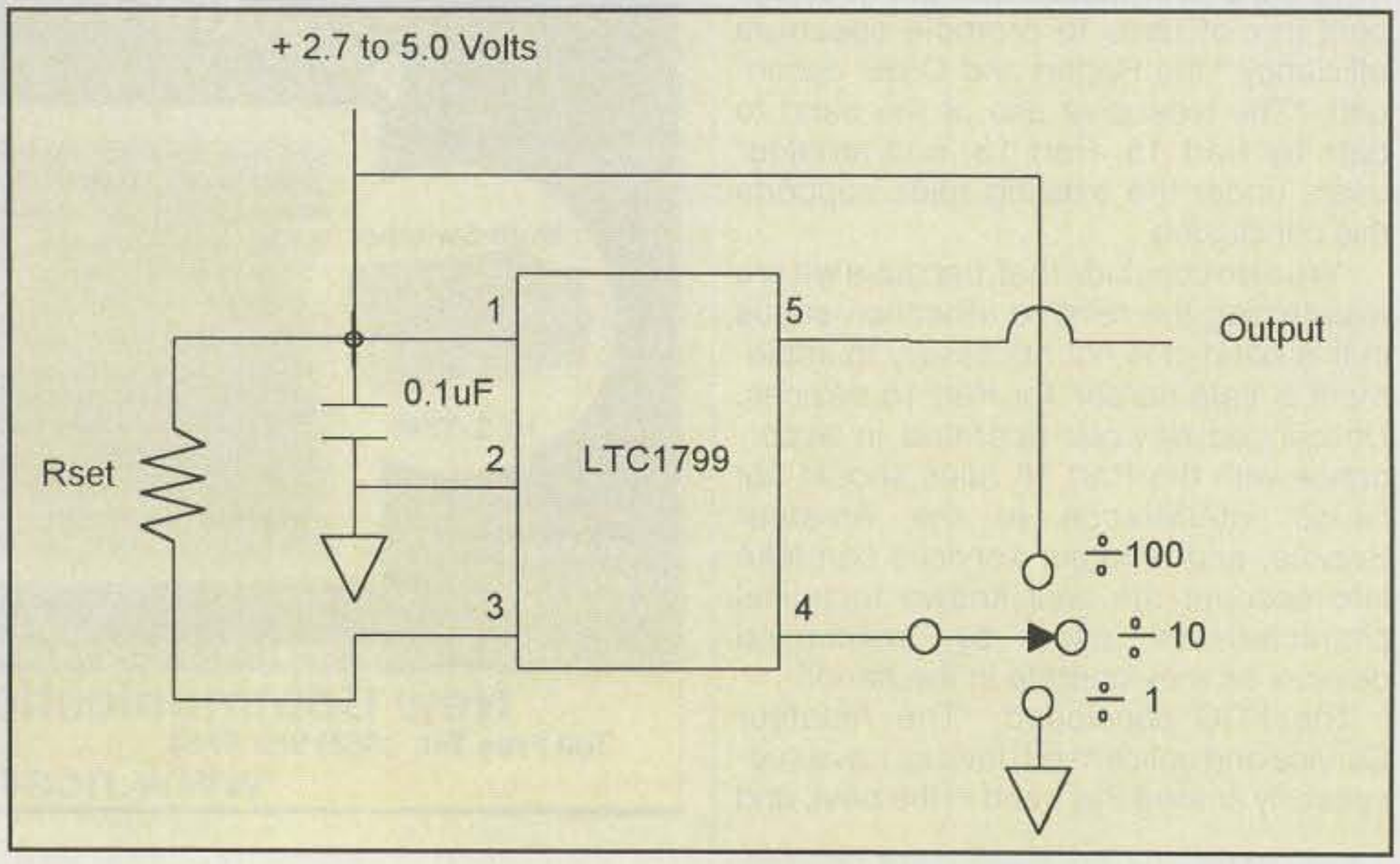

Fig. 1– Basic circuit of the LTC1799 oscillator. →

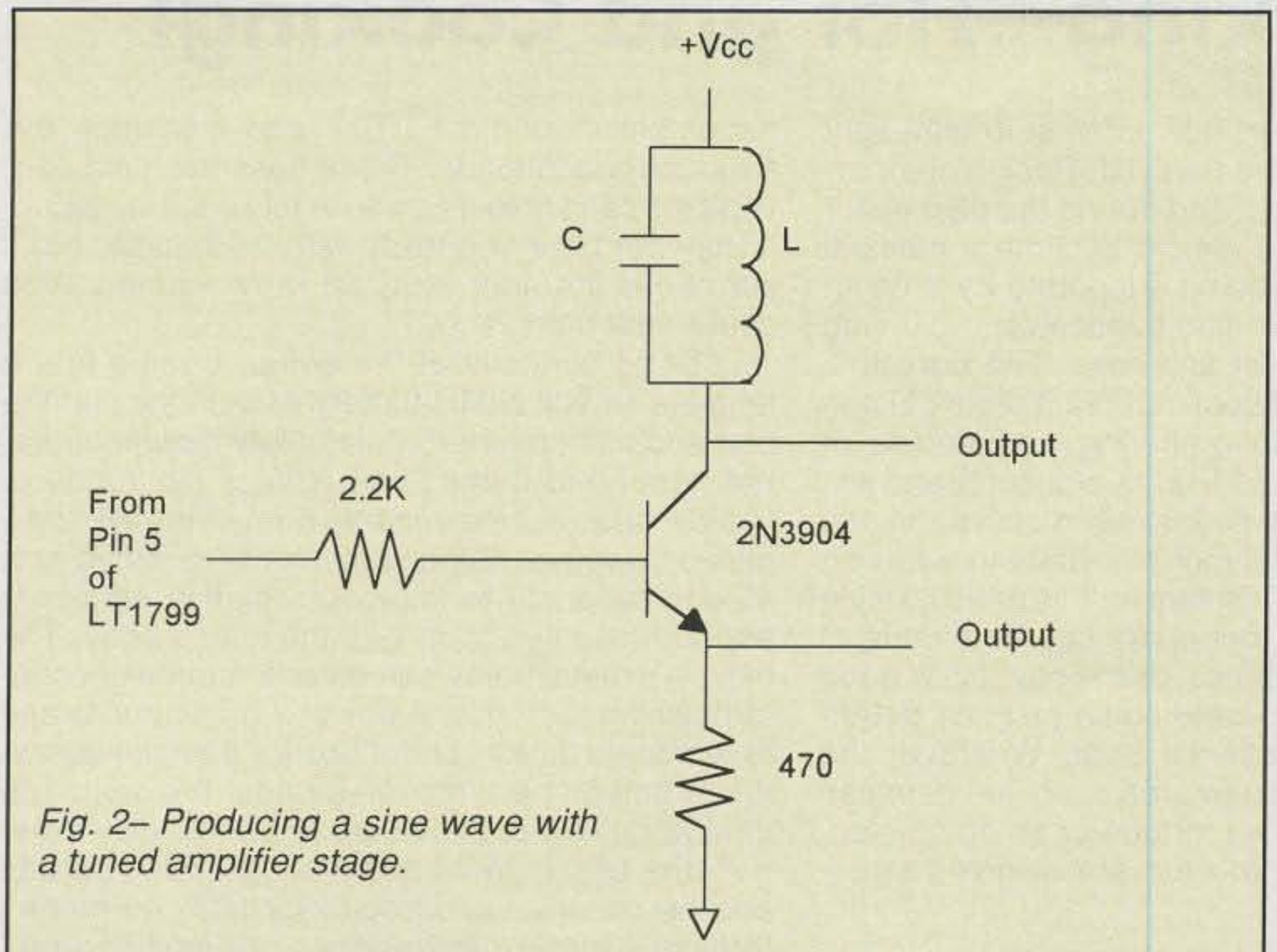

Fig. 2– Producing a sine wave with a tuned amplifier stage.

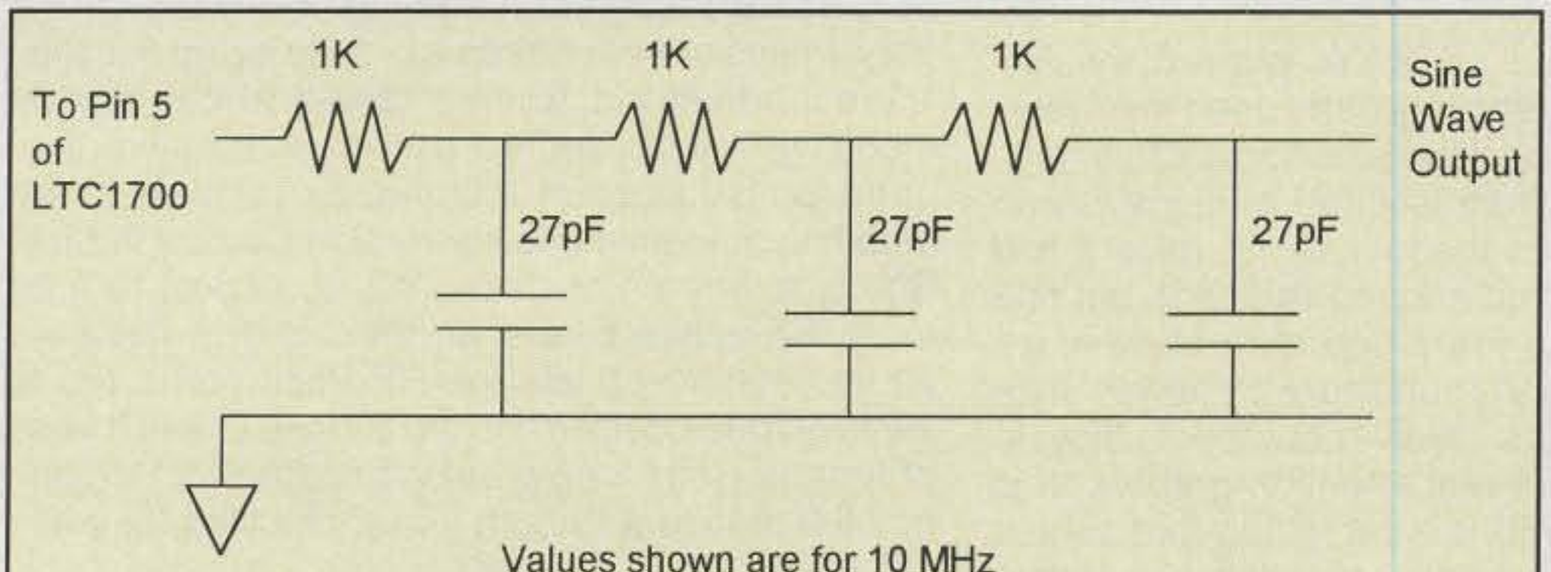

Fig. 3– Producing a sine wave with a low-pass filter.

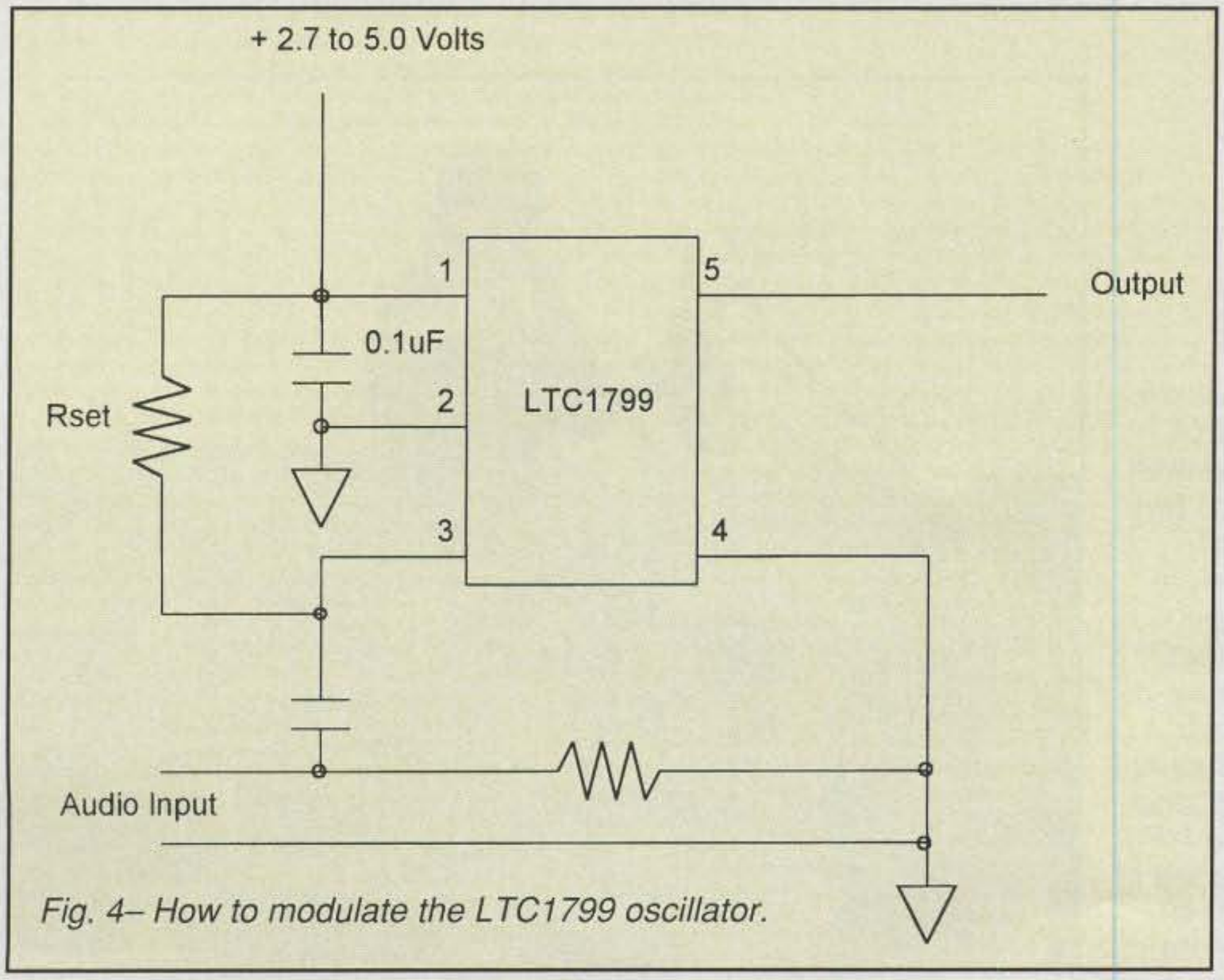

Fig. 4– How to modulate the LTC1799 oscillator.

this is one of the best courses of its kind available in the U.S.

Parts of the course are still in the planning stage, but some information is available on the college's website at <www.qcc.cuny.edu>. Once on the website, click on Laser and Fiber Optics Technology. Then click on the tabs at the top for Photos, Room S309 and Room S324. Unfortunately, at the moment, the tab for distance learning is not operating, but by the time you read this it may be active. At the time this is being written there is one distance learning lab course scheduled for the fall. It is PH232 INET (for internet). To get info on this, go to the QCC Home screen again. Click on Registrar. Then click on Schedule of Classes by Area of Interest. Next click on both Fall 2003 and Laser and Fiber Optics. This finally gets you to the appropriate information. If you still need an update or more information, contact Dr. David Lieberman at <dlieberman@qcc.cuny.edu>. Best of all, if you are a student within the City University of New York system, you can even get full credit toward a Bachelor of Science degree as well.

See you next month . . .

73, Irwin, WA2NDM

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BY DAVE INGRAM,* K4TWJ

HF Packing—Hot and Cooking!

Have you noticed how interest in ultra-light portable activities and HF Pack-type operations has increased during the past year? It's true. Packing has almost become a national craze, and it is also being supported by a captivating variety of new mini-transceivers, carrying bags, and break-down antennas. The pursuit is definitely red hot and cooking! Want proof? Listen on the group's main gathering frequencies of 18.157.5 and 14.342.5 MHz any weekend, and you will hear bicycle and pedestrian mobiles, hikers, campers, aeronautical mobiles, and more having a ball. Why such enthusiasm for this unusual style of hamming? Some operators cite its benefit of emergency preparedness, some say it is a good alternative to CC&Rs, and some just find out-of-shack hamming a special treat. Whatever the case, it is an exciting new area every amateur can join without spending a fortune or being an electronic wizard. Maybe you, too, should give it a go—and soon!

Bike'n Bonnie

When Bonnie Crystal, KQ6XA, started the HF Pack group several years ago, she used a military-type transceiver in a backpack and portable antenna to communicate from isolated areas of South America. She still has the military rig (plus a few more she has collected and refurbished), but she now lives in the San Francisco area and enjoys bicycle and pedestrian mobiling with newer style amateur transceivers. Her recumbent bicycle shown in photo A is a real attention-grabber. It is a 21-gear "Bike E" with a front fairing that serves double duty by acting as an audio deflector for the handlebar-mounted FT-817 and sidesteps the need for headphones. Those bass-booming convertibles can't hold a candle to this open-air setup. It may not blow you away with loud audio, but it surrounds the rider with real radio sounds. Who could want more?!

Looking carefully at the setup, Bonnie has a long-life 14 volt NIMH battery pack in the saddlebag and a miniature Paddlette key mounted near the right-hand brake lever (CW is her mode of choice after a long-winded ride). The W6MMA mini-screwdriver Super Antenna is mounted at a 45-degree angle to improve radiation efficiency and reduce interaction with the rider's body. The bicycle's metal frame serves as a ground or counterpoise for the setup. A pair of 9 volt batteries and an up/down motor control box for the mini-screwdriver antenna are mounted under the seat. The neat attraction of this setup is Bonnie can store/park the bike indoors and then just roll it outside and be on any band/frequency from 40 meters through 70 cm in just a moment—no ignition noise, no CC&Rs, just great hamming. Every school kid (regardless of age) needs a bicycle setup like this!

We understand Bonnie talked about bicycle mobiling and presented a very informative program on successful techniques for pedestrian mobiling at Hamvention® 2003 in Dayton in May. She is a very enthusiastic YL, so expect to hear more HF-active bikers on the band in the near future. Better yet, join the HF Pack group (go to <www.hfpack.com>) and the Bicycle Mobile Hams of America (see <www.LaFetra.com/BMHA>) and go bike mobile with both groups "pulling for you."

Packer in the Sky

HF Packers and 'Pack supporters are very interesting folks, and Captain Rick Dougherty, NQ4I,

*4941 Scenic View Drive, Birmingham, AL 35210
e-mail: <k4twj@cq-amateur-radio.com>

Photo A– HF Pack founder Bonnie Crystal, KQ6XA, bicycle mobile on the west side of San Francisco Bay while QSOing Captain Rick, NQ4I, aeronautical mobile enroute to Las Vegas. Bonnie's "Bike E" recumbent bicycle is equipped with a Yaesu FT-817 transceiver mounted on the handlebars and a W6MMA multiband MP-2 Super Antenna attached to the back rail. Awesome! (Photo courtesy KQ6XA)

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is a good example. After 25 years of flying military jets, earning the rank of major with Command Pilot wings, and flying for two major airlines, he is now an international captain for NetJets and flies the rich and famous everywhere imaginable. He has been to China four times and all over Europe, Russia, Africa, South America, and more places.

Most of the time Rick flies a Gulfstream G5 Business Jet that is equipped with two HF transceivers that run 200 watts to a 7 foot antenna with tuner embedded in the airplane's vertical tail section. The transceiver is pushbutton-tuned in 100 kHz steps. The antenna tuner must reset after any frequency shift, so Rick usually operates fixed-frequency style on 14.200, 21.318, or 28.480 MHz. Since Rick is an international pilot, many of his flights are quite long, and that is when he hits the HF bands. Rick is an avid contester and DXer at heart, and he has acquired numerous awards for operations from various DX locations. He says it is amazing to actually see the gray line stretching across the Earth while simultaneously communicating via gray-line propagation and to watch the famous Northern Lights while noting their effects on HF-band communications.

During a recent venture Rick flew from 3B8 Mauritius in the Indian Ocean to London on an all-night flight that began at 9 PM (the rich and famous live by a different clock). While high above the Seychelles area and at around 3 AM local time he experienced outstanding band conditions to both Europe and the U.S. on 15 meters. That's right, friends, a blowout 3 hour opening on 15 meters at 3 to 6 AM. It must be a totally different world high above the maddening crowd! Yes, and while Rick recalls many unique QSOs while air mobile, the ones with KQ6XA bicycle mobile and W3FF pedestrian mobile stand out as particularly memorable. No doubt about it, gang: HF Packing is a gas!

Photo B– As time permits, Captain Rick Dougherty, NQ4I, operates aeronautical mobile in a Gulfstream G5 Business Jet while flying the rich and famous around the country and the world. He has worked DX galore, yet his airplane-to-bicycle QSO with KQ6XA plus airplane-to-pedestrian mobile QSO with W3FF stand out as especially memorable. Rick's pushbutton-tuned HF rig is built into the cockpit dash behind his hand; its frequency readout is to the right of his hand.

Budd's 'Tennas

Listen on the main HF Pack frequencies of 18.157.5 and 14.342.5 MHz most Saturday and/or Sunday afternoons (at around 2200 or 2300 UTC) and you will hear Budd Drummond, W3FF, encouraging the troops onward and upward. Sometimes Budd moderates on-frequency activities; sometimes he, too, is outdoors operating pedestrian-mobile style with a backpacked rig and his famous Buddipole antenna. Like Bonnie, KQ6XA, Budd lives in a restricted area of California and takes his hamming outdoors on a regular

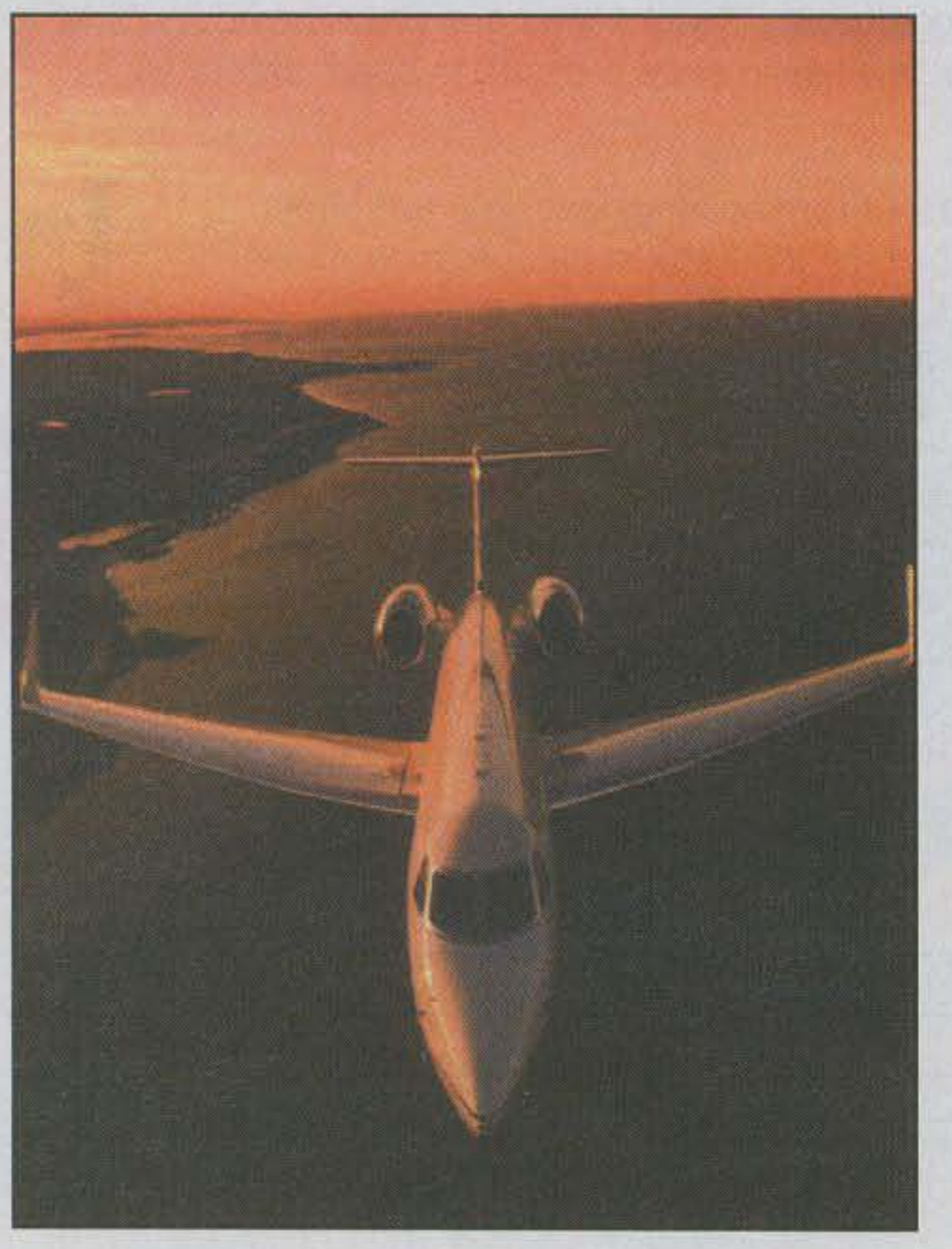

Photo C– NQ4I aeronautical mobile in flight and on the air. Listen for Captain Rick at around 28.480, 21.318, or 14.200 MHz on an occasional basis. (Photo courtesy NQ4I and K4PK)

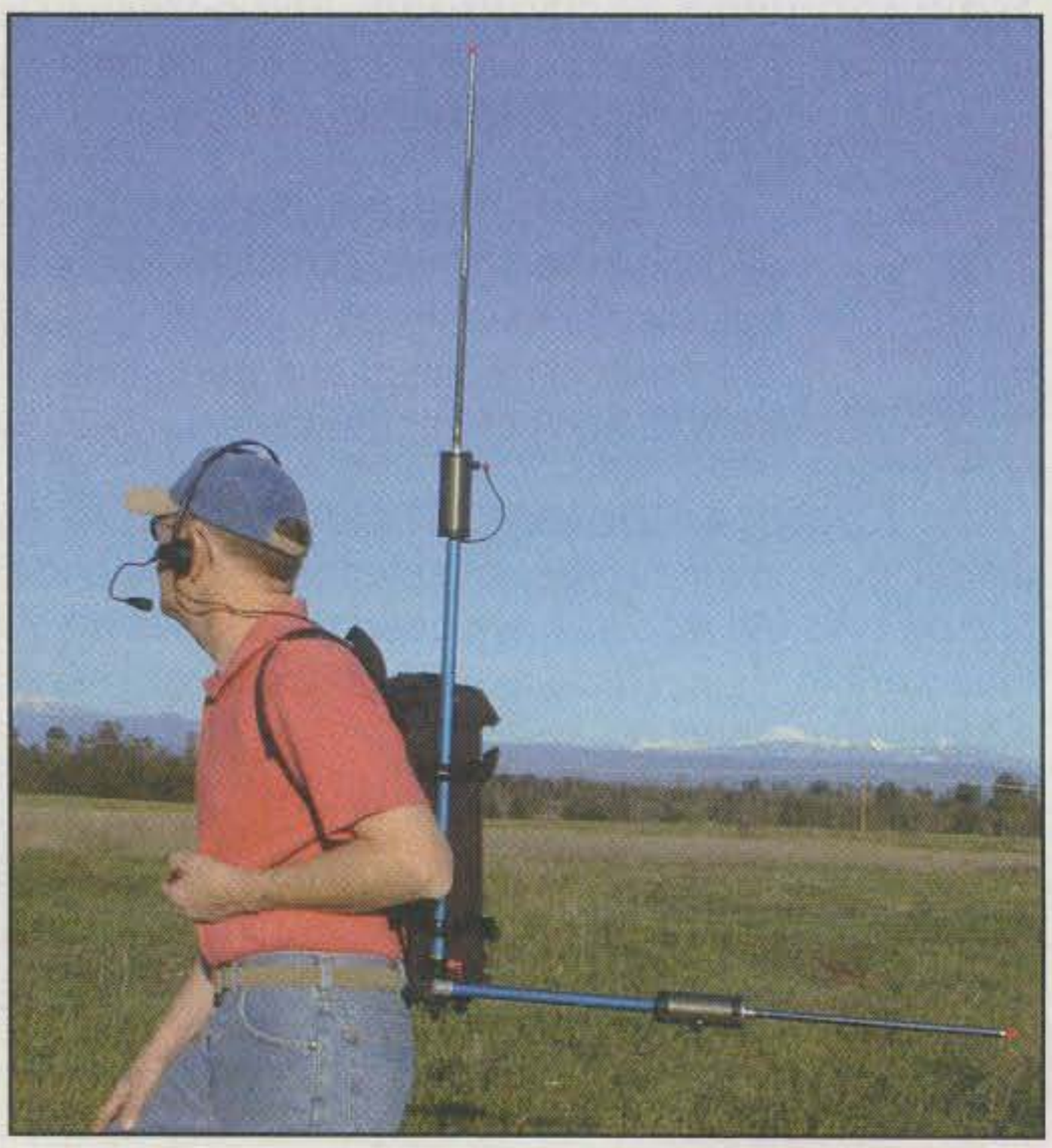

Photo D– Is that Captain Rick's Jet or another New Mexico-bound UFO in the distant sky? Budd Drummond, W3FF, operating Pedestrian Mobile while QSOing KQ4I aeronautical mobile. Budd's setup consists of a gel-cell-powered Kenwood TS-50 running 50 watts and his now-famous "Buddipole" multiband antenna. Here Budd has the antenna configured in an "L" and attached to the rig-carrying backpack for instant "strap on and go" (Budd-lite?) operations. (Photo courtesy W3FF)

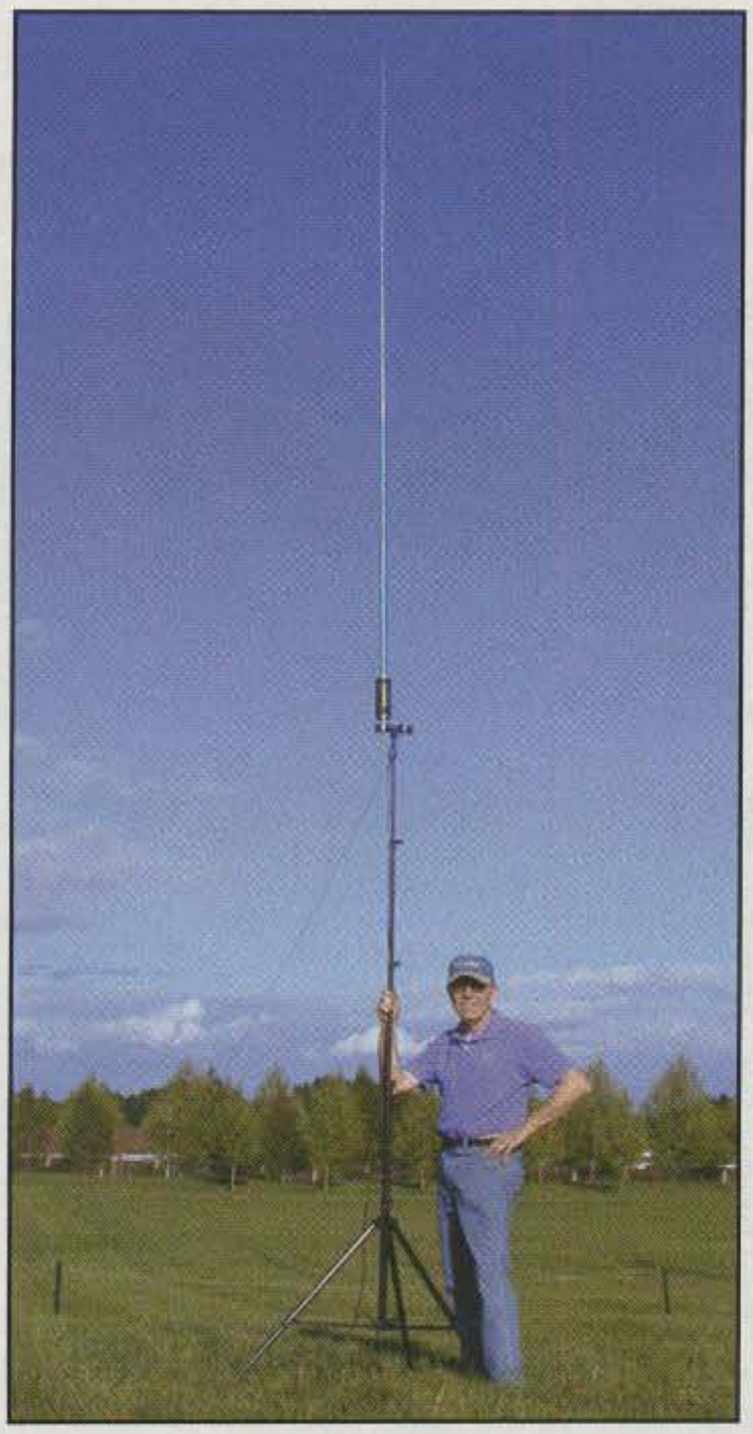

Photo E– Budd, W3FF, is always experimenting with ideas for making his popular Buddipole antenna even better, and the tall Buddistick shown here is a good example. It is optimized for 80/75 and 40 meter operation and has an elevated feedpoint plus directive radial system that works out very well. (Photo via W3FF)

basis. Also like Bonnie, Budd leaves his setup packed and ready for slip-on-and-go operation any time.

Early on Budd realized the benefits of using a reduced-size dipole (it did not require a counterpoise and offered mild directivity) and devised his "Buddipole," which works 40 through 6 meters and collapses down to fit in a backpack. Budd consistently had a good signal and everyone who saw his Buddipole wanted one, so he and son Chris, W6HFP, began producing them in quantity. The rest of the story is history. Today Buddipoles are in use around the world, and Budd uses quiet times in production to experiment with design enhancements. One example is the tall, yet still collapsible vertical, or Buddistick, shown in photo E. It has an elevated feedpoint with a directive radial system; it is optimized for 80/75, 40, and 30 meters; and it radiates a rompin' good signal. More details on Buddipoles and Buddisticks are available from

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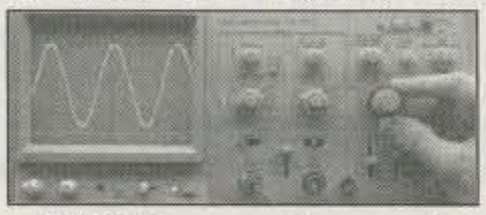

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Photo F– What's that? He went QRT? After working NQ4I/AM from the home QTH, your illustrious author, K4TWJ, goes pedestrian mobile only to find Captain Rick has signed off and landed in Las Vegas. Gotta improve that prep time! Setup is a shoulder-strapped FT-817, a hand-carried Buddipole, and a W4RT-modified mic with speech compressor and Heil element.

W3FF Antennas, 2390 Templeton Dr., Redding, CA 96002, telephone 530-226-8446, or at <www.buddipole.com>. Check it out!

Join the Fun!

Has HF Pack captured your interest and would you like to give it a good old college try? You can start simply by just stuffing your ultra-compact mobile transceiver and a 7 or 8 amp/hour gel-cell battery in a backpack. Use a pole-mounted mobile whip with a trailing quarter-wave counterpoise wire for a ground, use low power, watch your setup's SWR carefully, and have fun. After "getting your feet wet" (well, at least dusty from stomping around looking like a space cadet!), you can assemble a setup more in line with your particular needs. All it takes is money.

The main items in gear to look for are a transceiver with low current consumption, an automatic antenna tuner, a quick-to-assemble antenna, a headset with boom microphone, and a custom carrying case for "grab and go" convenience. The most popular transceivers for Packing at the present time are Yaesu's FT-817 (which includes a compartment for internal batteries, but lacks a built-in antenna tuner) and ICOM's new IC-703 (which includes an internal antenna tuner, but lacks a built-in battery compartment). Yaesu's FT-897 can accept both options, but you may find the transceiver a mite large or heavy for walk-and-talk HF'n (wheelbarrow mobile anyone?). When selecting a battery, incidentally, be sure to get one (or a pack) with an amp/hour rating equal to or greater than your transceiver's current consumption at a planned-to-use power level. If your rig draws 8 amps at 30 watts output, for example, go for an 8 AH battery. If you opt for a smaller, lighter weight and lower current battery/pack, reduce power/current consumption accordingly or you may experience a dead battery after 10 or 20 minutes of operation.

Do you really need an automatic antenna tuner? Yes, indeed, especially if you plan to operate pedestrian-mobile style or want quick on-the-air capabilities without a half hour of antenna dinking every time you move. You never

3.687.5 MHz CW
3.997.5 MHz SSB
7.087.5 MHz CW
7.242.5 MHz SSB
10.137.5 MHz CW
14.342.5 MHz SSB
18.157.5 MHz SSB (main info)
28.327.5 MHz SSB

Table I– Popular gathering spots for HF Pack activities. Keep a copy with your portable HF setup.

Photo G– The new LDG AT-897 Automatic Antenna Tuner attached to an FT-897. Add an internal battery pack to transceiver, and you have a complete stand-alone station.

Photo H– This latest addition to PowerPort's full line of portable rig carrying cases and rechargeable batteries is a serious backpacker's delight. It contains a padded and removable radio box that holds an IC-706 or similar-size rig and a gel-cell battery, plus it is loaded with pouches for antennas, books, a microphone, lunch, cell phone, and more. (Details in text.)

really realize how much SWR varies according to surroundings until you go mobile without a (metal body) automobile. It's frightful. That's why LDG Electronics' small Z11 and new AT-897 for the Yaesu FT-897 (and the W4RT One Touch Tune modules for them) are so popular. You just press a remote-tune button any time you move location and Bingo: The rig "sees" a low SWR. More details on LDG tuners are available at <www.ldgelectronics.com> or by telephoning 410-586-2177 (info) or 877-890-3003 (sales).

A clever choice in a "take it all with you" carrying pack for weekend outings is the new 22" × 17" × 8" DXpedition Pack from Cutting Edge Enterprises (photo H). This heavy-duty, nylon backpack has a removable and semi-rigid case that holds an IC-703 or similar-size rig and gel-cell battery for stand-alone use, plus enough built-in sections to carry a few days' worth of camping supplies. Wow! Check it out at <www.powerportstore.com> or order it from 1-800-206-0115.

Another new item with great appeal for all types of outdoor activities, travel, and even daily indoor use is the new MFJ Atomic clock-referencing wrist watch shown in photo I. This little gem actually receives time signals from WWVB in Colorado to maintain remarkable accuracy just like those super-expensive jobs, but this one is under $30. It also displays the day, month, and year, plus includes alarm, stopwatch, elapse time, and 12/24 hour time modes and a backlight. It is amazing, and it is available directly from MFJ (1-800-647-1800) or from amateur radio dealers nationwide.

Conclusion

That overflows available space for this month, but I sense a number of readers asking for more "inside details" on HF Pack—the gear, the accessories, and the "how to do it" aspects. All of your questions (and much more!) are answered in my new 88-page book *Ultra Light HF'n.* It is $16 plus postage ($2.50 book rate, $3.85 Priority Mail) autographed and available directly from me (Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210). It will get you going in high style.

On that note we must again "pull the plug" for this time while encouraging you to keep on hamming. Get on the air! Do your part to promote amateur radio!

73, Dave, K4TWJ

Photo I– Whether pedestrian mobile, vehicle mobile, in the shack, or in the office, MFJ's new atomic clock referencing wrist watch gives you state-of-the-art timekeeping with plenty of extra functions. Just watching it receive and self-calibrate to time signals from WWVB in Colorado is captivating. (Details in text.) →

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1.125"	$1.35/ft	2.125"	$3.50 /ft

In 6' or 12' lengths, 6' lengths ship UPS. Call for 3/16"& 1/4" rod, bar stock, and extruded tubing.

CUSHCRAFT ANTENNAS

13B2/A148-10S	$149/85
A270-6S/A270-10S	$79/99
A3S/A4S	$449/539
A50-3S/5S/6S	$95/169/259
A6270-13S	$189
AR2/ARX2B	$49/69
AR270/AR270B	$85/99
R6000/R8	$319/449
X7/X740	$679/289
XM240	$719

Please call for more Cushcraft items

FORCE 12–MULTIBAND

C3	10/12/15/17/20m, 7 el	$599
C3E	10/12/15/17/20m, 8 el	$649
C3S	10/12/15/17/20m, 6 el	$539
C3SS	10/12/15/17/20m, 6 el	$559
C4	10/12/15/17/20/40m, 8 el	$759
C4S	10/12/15/17/20/40m, 7 el	$679
C4SXL	10/12/15/17/20/40m, 8 el	$979
C4XL	10/12/15/17/20/40m, 9 el	$1119
C19XR	10/15/20m, 11 el	$959
C31XR	10/15/20m, 14 el	$1299

Please call for more Force 12 items

TRYLON "TITAN" TOWERS

SELF-SUPPORTING STEEL TOWERS

T200-64	64', 15 square feet	$1099
T200-72	72', 15 square feet	$1299
T200-80	80', 15 square feet	$1499
T200-88	88', 15 square feet	$1769
T200-96	96', 15 square feet	$2049
T300-88	88', 22 square feet	$1989
T400-80	80', 34 square feet	$1899
T500-72	72', 45 square feet	$1799
T600-64	64', 60 square feet	$1699

Many more Trylon towers in stock!

BENCHER / BUTTERNUT

Skyhawk, Triband Beam	$1129
HF2V, 2 Band Vertical	$249
HF5B, 5 Band Minibeam	$359
HF6VX, 6 Band Vertical	$339
HF9VX, 9 Band Vertical	$369
A1712, 12/17m Kit	$54
CPK, Counterpoise Kit	$129
RMKII, Roof Mount Kit	$159
STRII, Roof Radial Kit	$125
TBR160S, 160m Kit	$139

More Bencher/Butternut–call

M2 VHF/UHF ANTENNAS

144–148 MHz

2M4/2M7/2M9	$95/109/129
2M12/2M5WL	$165/209
2M5-440XP, 2m/70cm	$179

420–450 MHz

440-470-5W/420-450-11	$139/95
432-9WL/432-13WLA	$179/239
440-18/440-21ATV	$129/149

Satellite Antennas

2MCP14/2MCP22	$169/239
436CP30/436CP42UG	$239/279

ROHN TOWER

25G/45G/55G	$89/189/239
25AG2/3/4	$109/109/139
45AG2/4	$209/225
AS25G/AS455G	$39/89
BPC25G/45G/55G	$75/99/110
BPL25G/45G/55G	$85/109/125
GA25GD/45/55	$68/89/115
GAR30/GAS604	$35/24
SB25G/45/55	$39/89/109
TB3/TB4	$85/99

Please call for more Rohn prices

US TOWER

MA40/MA550	$849/1399
MA770/MA850	$2359/3649
TMM433SS/HD	$1139/1379
TMM541SS	$1499
TX438/TX455	$979/1579
TX472/TX489	$2459/4579
HDX538/HDX555	$1269/2269
HDX572MDPL	$5899

Please call for help selecting a US Tower for your needs. Shipped factory direct to save you money!

COMET ANTENNAS

GP15, 6m/2m/70cm Vertical	$149
GP6, 2m/70cm Vertical	$139
GP9, 2m/70cm Vertical	$179
B10NMO, 2m/70cm Mobile	$36
SBB224NMO,2m/220/70cm	$69
SBB2NMO, 2m/70cm Mobile	$39
SBB5NMO, 2m/70cm Mobile	$55
SBB7NMO, 2m/70cm Mobile	$75
Z750, 2m/70cm Mobile	$55
Z780, 2m/70cm Mobile	$69

Much more Comet in stock–call

M2 ANTENNAS

50–54 MHz

6M5X/6M7JHV	$209/269
6M2WLC/6M9KHW	$459/499

10/12/15/17/20m HF

10M4DX, 4 Element 10m	$399
12M4DX, 4 Element 12m	$399
15M4DX, 4 Element 15m	$449
17M3DX, 3 Element 17m	$399
20M4DX, 4 Element 20m	$529

More M2 models in stock–please call

GLEN MARTIN ENGINEERING

Hazer Elevators for 25G

H2, Aluminum Hazer, 12 sq ft	$359
H3, Aluminum Hazer, 8 sq ft	$269
H4, HD Steel Hazer, 16 sq ft	$339

Aluminum Roof Towers

RT424, 4 Foot, 6 sq ft	$159
RT832, 8 Foot, 8 sq ft	$239
RT936, 9 Foot, 18 sq ft	$389
RT1832, 17 Foot, 12 sq ft	$519

Please call for Glen Martin info

UNIVERSAL ALUMINUM TOWERS

4-40'/50'/60'	$539/769/1089
7-50'/60'/70'	$979/1429/1869
9-40'/50'/60'	$759/1089/1529
12-30'/40'	$579/899
15-40'/50'	$1019/1449
23-30'/40'	$899/1339
35-30'/40'	$1019/1569

Bold in part number shows wind-load capacity. Please call for more Universal models. All are shipped factory direct to save you money!

DIAMOND ANTENNAS

D130J/DPGH62	$79/139
F22A/F23A	$89/119
NR72BNMO/NR73BNMO	$39/54
NR770HBNMO/NR770RA	$55/49
X200A/X3200A	$129/210
X500HNA/700HNA	$229/369
X510MA/510NA	$189/189
X50A/V2000A	$99/149
CR627B/SG2000HD	$99/79
SG7500NMO/SG7900A	$75/112

More Diamond antennas in stock

MFJ ANTENNAS

259B	$219
269	$299
941E	$109
945E	$99
949E	$139
969	$169
986	$289
989C	$309
1798, 80–2m Vertical	$249
1796, 40/20/15/10/6/2m Vert.	$189

Big MFJ inventory–please call

COAX CABLE

RG-213/U, (#8267 Equiv.)	$.36/ft
RG-8X, Mini RG-8 Foam	$.19/ft
RG-213/U Jumpers	Please Call
RG-8X Jumpers	Ple ase Call

Please call for more coax/connectors

TIMES MICROWAVE LMR® COAX

LMR-400	$.59/ft
LMR-400 Ultraflex	$.89/ft
LMR-600	$1.19/ft
LMR600 Ultraflex	$1.95/ft

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3/8"EE / EJ Turnbuckle	$11/12
1/2"x9"EE / EJ Turnbuckle	$16/17
1/2"x12"EE / EJ Turnbuckle	$18/19
3/16" / 1/4" Preformed Grips	$5/6

Please call for more hardware items

HIGH CARBON STEEL MASTS

5 FTx .12" / .18"	$35/59
11 FT x .12" / 10 FT x .18"	$80/129
16 FT x .12" / 16 FT x .18"	$119/179
20 FT x .25"	$315
22 FT x .12" / 21 FT x .18"	$149/235

GAP ANTENNAS

Challenger DX	$289
Challenger Counterpoise	$29
Challenger Guy Kit	$19
Eagle DX	$299
Eagle Guy Kit	$29
Titan DX	$329
Titan Guy Kit	$29
Voyager DX	$409
Voyager Counterpoise	$49
Voyager Guy Kit	$45

Please Call for Delivery Information

LAKEVIEW HAMSTICKS

9106	6m	9115	15m
9110	10m	9117	17m
9112	12m	9120	20m
9130	30m		
9140	40m		
9175	75m		

All handle 600W, 7' approximate length, 2:1 typical VSWR... $24.95

HUSTLER ANTENNAS

4BTV/5BTV/6BTV	$129/169/189
G6-270R, 2m/70cm Vertical	$169
G6-144B/G7-144B	$109/179

Hustler Resonators in stock–call

ANTENNA ROTATORS

M2 OR-2800P	$1249
Yaesu G-450A	$249
Yaesu G-800SA/DXA	$329/409
Yaesu G-1000DXA	$499
Yaesu G-2800SDX	$1089
Yaesu G-550/G-5500	$299/599

ROTATOR CABLE

R62 (#18)	$.32/ft.
R81/82	$.25/ft./.39/ft.
R84	$.85/ft

PHILYSTRAN GUY CABLE

HPTG1200I	$.45/ft
HPTG2100I	$.59/ft
PLP2738 Big Grip (2100)	$6.00
HPTG4000I	$.89/ft
PLP2739 Big Grip (4000)	$8.50
HPTG6700I	$1.29/ft
PLP2755 Big Grip (6700)	$12.00
HPTG11200	$1.89/ft
PLP2758 Big Grip (11200)	$18.00

Please call for more info or help selecting the Phillystran size you need.

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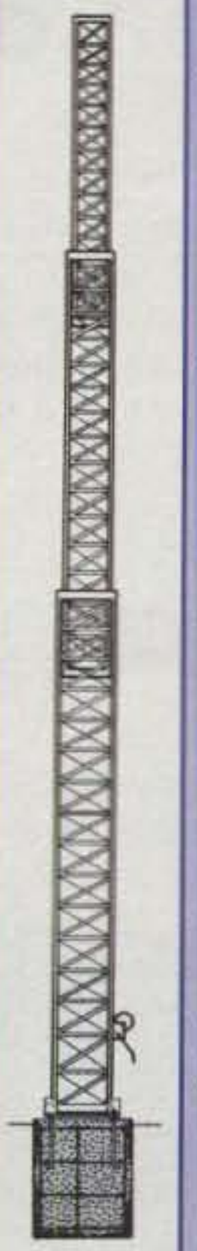
• MDP & MDPL models include motor drive

• Options include coax arms, raising fixtures, masts, motor drives, and more!

Now shipping from CA for west coast customers, and KS for east coast and midwest customers, to reduce freight cost!

TX SERIES HEAVY DUTY CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
TX-438	38'	21'6"	355	$1,269	$979
TX-455	55'	22'	670	$1,915	$1,579
TX-472	72'	22'8"	1040	$3,147	$2,459
TX-472MDPL	72'	22'8"	1210	$5,064	$3,999
TX-489	89'	23'4"	1590	$5,475	$4,579
TX-489MDPL	89'	23'4"	1800	$8,212	$6,429



HDX SERIES CRANK-UP TOWERS

• Heavy duty, handles 44.7 square feet of antenna load at 50 MPH, 35 square feet at 70 MPH.

• All models supllied with hinged T-base, anchor bolts, hand winch (except motor drive models), top plate, and rotor plate.

• MDPL models include motor drive

• Options include coax arms, raising fixtures, masts, motor drives, and more!

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HDX SERIES HEAVY DUTY CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
HDX-538	38'	21'6"	600	$1,642	$1,269
HDX-555	55'	22'	870	$2,874	$2,269
HDX-572MDPL	72'	22'8"	1600	$7,528	$5,899
HDX-589MDPL	89'	23'8"	2440	$9,855	$7,699
HDX-689MDPL	89'	23'8"	3450	$19,039	$14,999
HDX-5106MDPL	106'	24'8"	3700	$20,719	$15,999

MA SERIES CRANK-UP MASTS

• Handles up to 22 square feet of antenna load. (See chart below)

• MDP & MDPL models include motor drive.

• All models supllied with anchor bolts, load-actuated hand winch, and house bracket.

• Options include coax arms, raising fixtures, motor drives, self-supporting and rotator bases, remote control panel, and more!

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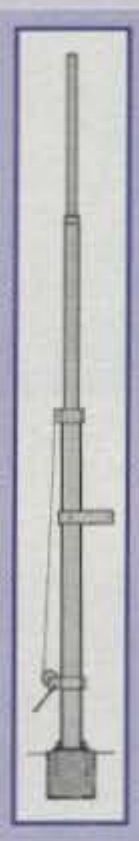

MA SERIES CRANK-UP MASTS							
MAST MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	50 MPH (sq. ft.)	70 MPH (sq. ft.)	LIST PRICE	SALE PRICE
MA-40	40'	21'6"	242	16.5	6.8	$1,007	$849
MA-550	55'	22'1"	435	22	9	$1,704	$1,399
MA-550MDP	55'	22'1"	620	22	9	$3,258	$2,729
MA-770	71'	22'10"	645	15.5	5.5	$2,810	$2,359
MA-770MDPL	71'	22'10"	830	15.5	5.5	$4,445	$3,729
MA-850MDPL	85'	23'6"	1128	15.3	6.3	$5,991	$5,029

TMM SERIES COMPACT CRANK-UP TOWERS

• Handles 20 square feet of antenna load at 50 MPH, 8 square feet at 70 MPH.

• Compact design is great for areas with tower restrictions, or where a less intrusive installation is desirable.

• All models supllied with hinged T-base, anchor bolts, load-actuated hand winch, 8' steel mast, top plate, and rotor plate.

• Options include coax arms, raising fixtures, motor drives, thrust bearing, remote control panel, and more!

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TMM SERIES COMPACT CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
TMM-433SS	33'	11'4"	315	$1,355	$1,139
TMM-433HD	33'	11'4"	400	$1,624	$1,379
TMM-541SS	41'	12'	430	$1,779	$1,499

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mobiling

BY JEFF REINHARDT,* AA6JR

Innovative Antenna Solutions and "True Confessions"

Hello again, Knights of the Road. I hope your mobile adventures have been rewarding. This month we have a lot to cover on installing, operating, and improving your mobile communications system. I'll also share some responses we received relative to our last column, so let's dive in!

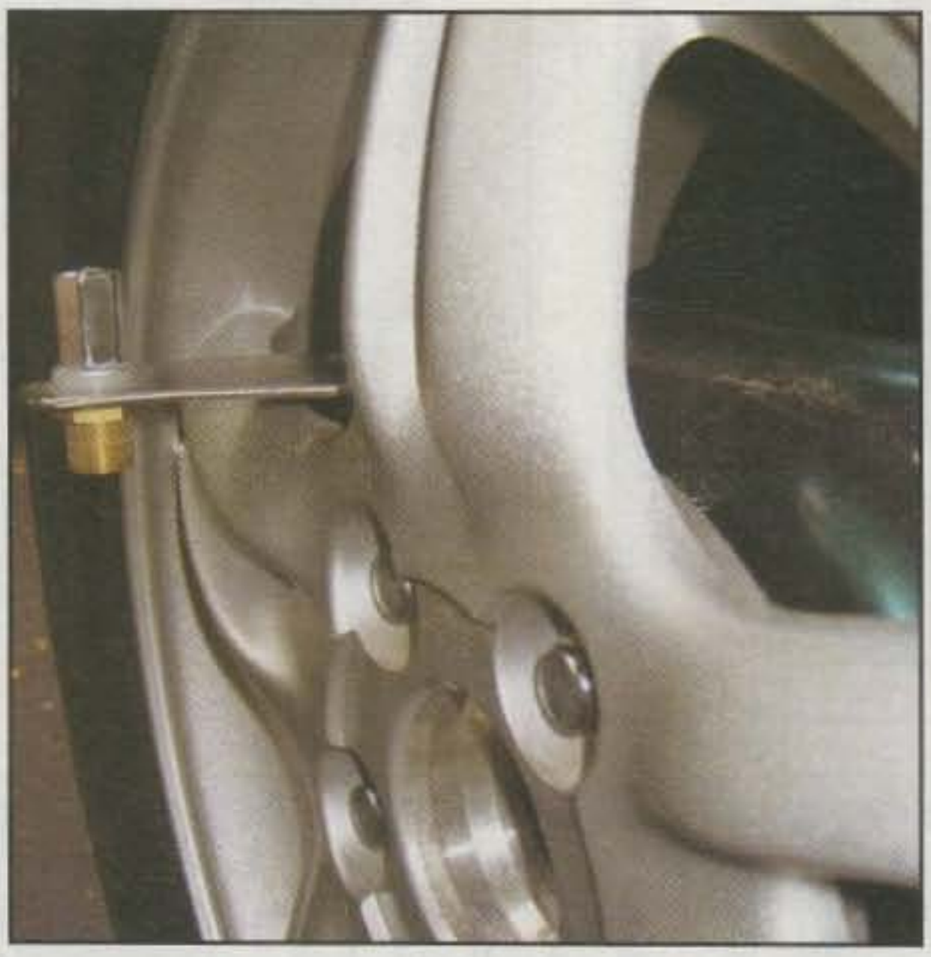
A Nifty Antenna Solution

If you drive an SUV, and it seems much of the world does these days, check out the photos taken of the K9XT mobile operation. K9XT, who answers to "John," and a friend, Wally, N6CDJ, looked at John's Honda CRV trying to find a good location for an HF antenna mount. Now K9XT had already had drilled a hole in his roof for a VHF/UHF antenna, and he wanted a mount situated so that he could easily place the HF antenna for those long trips but remove it for travel around town. Wally looked over the vehicle and saw a good opportunity using the rear-gate spare-tire mount. They created a cardboard model that attached to the spare tire's lug bolts and poked through an opening in the spare wheel. A quick trip to a sheet-metal fabricator resulted in the very simple, clean, and easy-to-use mount you see in the photos. The coax

*5904 Lake Lindero Drive, Agoura Hills, CA 91301
e-mail: <aa6jr@cq-amateur-radio.com>

Here's the ingenious mount used by K9XT for his Honda CRV.

The K9XT mobile mount was fabricated from a simple design created from a cardboard model.



With the spare tire in place, K9XT's antenna is securely mounted and the base is grounded.

Just tuck in the coax, connect the radio, and enjoy HF mobile!

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RSGB Books now available from CQ

Antenna Topics

byPat Hawker, G3VA

RSGB. 2002 Ed. 384 pages.
This book is a chronological collection of selections of G3VA's words over the years. Hundreds of areas and subjects are covered and many a good idea is included.

Order No. RSAT $29.00

HF Antenna Collection

RSGB, 1st Ed., 1992. 233 pages.
A collection of outstanding articles and short pieces which were published in Radio Communication magazine during the period 1968-89. Includes ingenious designs for single element, beam and miniature antennas, as well providing comprehensive information about feeders, tuners, baluns, testing, modeling, and how to erect your antenna safely.

Order: RSHFAC $16.00

IOTA Directory - 11th Edition

Edited by Roger Balister, G3KMA.
RSGB, 2002 Ed., 128 pages
This book is an essential guide to participating in the IOTA (Islands on the Air) program. It contains everything a newcomer needs to know to enjoy collecting or operating from islands for this popular worldwide program.

Order: RSIOTA $15.00

Antenna Toolkit 2

By Joe Carr, K4IPV
RSGB & Newnes, 2002 Ed.
256 pages.A definitive design guide for sending and receiving radio signals. Together with the powerful suite of CD software included with this book, the reader will have a complete solution for constructing or using an antenna; everything but the actual hardware!

Order: RSANTKIT2 $40.00

Practical Projects

Edited by Dr. George Brown, M5ACN
RSGB 2002 Ed, 224 pages
Packed with around 50 "weekend projects," Practical Projects is a book of simple construction projects for the radio amateur and others interested in electronics. Features a wide variety of radio ideas plus other simple electronic designs and a handy "now that I've built it, what do I do with it?" section. Excellent for newcomers or anyone just looking for interesting projects to build.

Order: RSPP $19.00

Low Power Scrapbook

RSGB. © 2001, 320 pages.
Choose from dozens of simple transmitter and receiver projects for the HF bands and 6m, including the tiny Oner transmitter and the White Rose Receiver. Ideal for the experimenter or someone who likes the fun of building and operating their own radio equipment.

Order: RSLPS $19.00

The Antenna File

RSGB. ©2001. 288 pages. **$34.95.**
Order: **RSTAF**
50 HF antennas, 14 VHF/UHF/SHF antennas, 3 receiving antennas, 6 articles on masts and supports, 9 articles on tuning and measuring, 4 on antenna construction, 5 on design and theory, and 9 Peter Hart antenna reviews. Every band from 73kHz to 2.3GHz!

Order: RSTAF $32.00

The Antenna Experimenter's Guide

RSGB. 2nd Ed, 1996. 160 pages.
Takes the guesswork out of adjusting any antenna, home-made or commercial, and makes sure that it's working with maximum efficiency. Describes RF measuring equipment and its use, constructing your own antenna test range, computer modeling antennas. An invaluable companion for all those who wish to get the best results from antennas!

Order: RSTAEG $28.00

HF Amateur Radio

RSGB. 2002 Ed.
The HF or short wave bands are one of the most interesting areas of amateur radio. This book takes the reader through setting up an efficient amateur radio station, which equipment to choose, installation, and the best antenna for your location and MUCH more.

Order: RSHFAR $21.00

Radio Communication Handbook

Edited by Dick Biddulph, G8DPS and Chris Lorek, G4HCL.
RSGB, 7th Ed., 2000, 820 pages.
This book is an invaluable reference for radio amateurs everywhere. It also provides a comprehensive guide to practical radio, from LF to the GHz bands, for professionals and students.

Order: RSRCH $50.00

Amateur Radio Mobile Handbook

RSGB. 2002 Ed., 128 pages.
The Amateur Radio Mobile Handbook covers all aspects of this popular part of the hobby. It includes operating techniques, installing equipment in a vehicle and antennas, as well as maritime and even bicycle mobile. This is essential reading if you want to get the most out of your mobile station.

Order: RSARMH $21.00

Backyard Antennas

RSGB, 1st Ed., 2000, 208 pages.
Whether you have a house, bungalow or apartment, Backyard Antennas will help you find the solution to radiating a good signal on your favorite band.

Order: RSBYA $30.00

RSGB Prefix Guide

By Fred Handscombe, G4BWP.
RSGB. 6th Ed., 2003. 48 pages.
This book is an excellent tool for the beginner and the experienced hand alike. Designed with a "lay flat" wire binding for ease of use the new "Prefix Guide" is a must for every shack.

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Here's K9XT's mount for his Yaesu FT-100D HF mobile rig. It's sturdy, securely mounted, and convenient to the operator.

For those who needed radio mounting tips for their Hummers, the Dayton Hamvention® provided answers!

The backside of the K9XT mobile mount shows secure attachment to the passenger seat rail.

is easily routed through the rear gate. Add a "stick" antenna and you're in business!

Also check out the photos of K9XT's radio-mounting system. It uses the very sturdy seat-track bolts (they're also an excellent ground-strap mounting point). What I like is that the radio faces up and toward the operator, is clear of the air-bag deployment zone, does not interfere with the passenger or any vehicle controls, and there's no danger of the radio taking flight should there a be a sudden stop (or worse).

K9XT reports good results with the system and contacts with many who couldn't believe the strong signals were coming from a mobile!

Dayton Report

The "Big Three" U.S. auto makers had displays at the Dayton Hamvention® and they were quite busy speaking with the large audience. All showed off some vehicles as well, but I'm not so sure the hot Mustang GT 5 that Ford brought lends itself to being a good mobile platform. It did have many hams drooling on it, however. ("Honey, look at the deal I found at Dayton!") Nevertheless, I had a chance to chat with a few engineers and reinforce some of what we already know about good mobile installations. Was there anything new and exciting relative to mobile ops? Not from the car manufacturers, anyway. It is good to know they still support mobile radio operations and that they sent qualified engineers to the convention, many of whom were also hams.

Ford handed out a very nice brochure on mobile installation. You can download it at <http://www.fordemc.com/> and in the process get additional information from their website. Thanks to Bob, K4RXR, for the web tip!

All of the radio manufacturers present at Dayton had very capable mobile transceivers on display, with Kenwood showing a prototype HF+6m mobile rig and Alinco rumored to be working on one as well.

High Sierra antennas had a nice display and some new developments in small, lightweight mobile HF antennas. In a future column I plan to share an installation experience with one of their products. Stay tuned!

I was at Dayton in several different capacities, so I didn't have as much time to spend on mobile operations as I would have liked. I did get to meet and chat with several mobile operators, including County Hunters, Ten-Ten members, and even some of the folks who have made contributions to this column. Dayton is a great gathering place, but I just never seem to have the time to do everything I want to!

Help Requests and Responses

Our "Hams Helping Hams" segment is off to a great start. Thanks for all the great responses. From our last visit, you might remember N8POE had a problem fitting radios into his manual-shift Ford Ranger pickup. K4RXR responds:

If your Ranger has any kind of storage bin near the shifter, I have an idea that might work. I had a Chevy S-10 pickup and it had a small center console. I trimmed a piece of two-by-four lumber to fit in the little storage bin. I could then attach the mounting bracket for my dual-band mobile to the piece of two-by-four. I secured the two-by-four to the console with bungee cords. I currently have a 1995 Ford Explorer that also has a center console. I've used the same basic mounting idea, though with a piece of one-by-six lumber.

Unfortunately, K4RXR didn't send photos, but perhaps you get the idea. I'm always a bit wary of bungees as part of an installation (they wear out and

break), but there often are other means of securing gear using straps, belts, Velcro® straps, or locking tie-wraps.

Doug, N4YKQ, sends the following:

In reference to your comment in your "Mobiling" column from the May 2003 *CQ*, "...most police...communications are FM, but suppressing electrical noise would seem to be in the interest of Ford engineers." As a police officer and former professional installer at a Motorola authorized dealer and service shop, I can tell you that Ford Crown Vic Police Interceptors come with grounding straps that bond the front and rear bumpers and exhaust tail pipes to the frame and straps that bond the hood and trunk lid to the body of the car. I personally have never noticed any problem with the radios due to the car itself. Any RFI encountered on a police car is usually caused by strobe lights or noisy motors on rotating lights.

When I was an installer, we also had a problem with computer hash on several new state Department of Transportation trucks. The trucks were either Chevy or GMC with the 6.5 liter diesel engine. I forget the radio frequency, but it was in the 46 MHz range. Our tech spoke with an engineer at GM who had us pull fuses one at a time to isolate various computers on the truck until we found the offending unit. The engineer then had to build new computers just for these trucks by changing the clock frequency so the harmonics would no longer interfere with the state radio. These computers then had to be installed by the local GM dealer. Don't expect the same level of cooperation for a personal vehicle. Just thought the story would interest you.

And it does! Catch the emphasis placed on electrically bonding the body parts; it's so important for HF operations. Thanks for sharing, Doug.

Also from the May issue, you may remember Paul was trying to access the audio input from the entertainment system of a Ford F-150 to possibly input the audio from a ham transceiver to the optional CD player input. While we didn't get a specific tip on feeding audio directly into the car radio, Bob, N2MDA, wrote to suggest using a low-power FM broadcast transmitter (often found in kit form) to send the ham audio through the vehicle's entertainment-system speakers. Great idea, Bob! With a stereo transmitter you could even split a dual-band transceiver's bands to the left or right channels! N2MDA also suggested looking into an amplified speaker, available from MFJ and other sources.

True Confessions

Last time I asked for "here's where I messed up" stories. Keep them coming, and we'll prove that we can also learn by our mistakes.

Hi, Jeff. I enjoy your column very much. Just wanted to tell you of a mobile experience I had. I have two separate antennas and radios for HF and 2 meters. I wasn't getting out on HF, so I checked the SWR and it indicated there was a dead short, infinite SWR. I couldn't figure out what was wrong, so I went to a friend's; he helped check my installation. After and hour or so he checked the coaxes and found that I had crossed them. So, the moral of the story is be sure to label your feedlines before hooking them up.

—73, Eugene, WØICY

An innocent mistake many have made, particularly with today's newer multiband transceivers. Share your "I learned the hard way" story at the e-mail address at the beginning of this column. We'll even withhold your name if you request.

Operations

At the time of this writing HF band conditions have been pretty bleak for quite some time. Fortunately, most mobile operators have VHF and UHF as additional operating choices. Don't overlook 6 meters, however, particularly during the warm-weather months. Good DX contacts can crop up, adding to your mobile enjoyment. There's a reason they call 6 "The Magic Band"!

This Month's Chuckle

The very first Japanese Kenwood commercial mobile radio I noticed was in a New York City taxi cab back in the 1980s. Fast forward to April 2003. I was traveling in Japan, taking a day to explore some of the sights way off "the beaten path" in a remote part of Shikoku Island. From the train station we hired a cab to take us to our destination. I broke into grin as I noticed the clean, modern Japanese cab conducting its communications through a Motorola transceiver. Is this a strange world or what?

Movin' On Down the Road

We've packed a lot into this visit! I'll close by offering a tribute to one of the best mobile operators I ever heard who just became a Silent Key, Ken Carpenter, KC4UG. Ken was a friend to everyone. He often would drive hundreds of miles to get someone a needed county contact. I met him through the County Hunters Net, and we often enjoyed chatting there and elsewhere. In a fitting tribute, the County Hunters have just named an award in his honor.

Next time you pass a Waffle House, smile and think of this most extraordinary Road Warrior. I think "Kennuh" knew where every single one is located.

'Til next time . . . 73, Jeff, AA6JR

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qrp

BY DAVE INGRAM,* K4TWJ

Fun with Skywires

Whether you are a casual or a serious QRPer, and regardless of how many rigs you have, antennas always stand as a top area of interest. Why? Probably because QRP and low-profile hamming go hand-in-hand and because an effective antenna helps offset the (rumored) limitations of using low power. Likewise, two groups or categories of antennas have proven popular for QRP: the "hidden" types for covert operations in unfavorable locations and the higher performance types for big-time QRP'n.

As you surely have noticed, most QRPers favor wire antennas for both casual and serious work. That makes sense. Wire antennas represent the best performance-per-dollar value in amateur radio today. Which wire antennas are considered good for QRP? Any that radiate a good signal for your particular situation, limitations, and budget, I would say, and every situation is different. That is why we all like studying and reviewing different styles of antennas and visualizing how they are made and how they fit in different locations, and that is precisely the focus of this month's column. We have some very interesting designs to share with you. Let's begin with some simple, quick-brew items and then start "raising the bar."

End-Fed Dipoles

The popularity of dipoles for QRP is undeniable, but their center-located feedpoint does not always mate with a location's available trees and supports. After experiencing that dilemma in several portable/vacation operations, I devised what I call an *end-fed dipole,* and several QRP groups have used and expanded it admirably recently. Our compliments to all on their creativity!

My first version of end-fed dipole is illustrated in fig. 1. One side, or element, consists of a quarter-wavelength of insulated hookup wire soldered to only the center conductor of a half- or full-wavelength section of 50 ohm coax feedline (such as RG-58 or RG-8X). The other side consists of a quarter wavelength of shield or braid removed from an old, larger diameter section of coax such as RG-8 or RG-213 and threaded over a quarter-wave section of the smaller diameter (RG-58 or RG-8X) feedline. The two coax shields, or braids, are soldered together at the center feedpoint position, producing a simple dipole with its feedline routed through the center of one side, or element.

The physically weak point of this dipole is its middle, as the quarter wavelength of hookup wire can pull against the coax feedline's center conductor and stretch or pull it from the cable's end. Use strain-relief clamps and monofilament tape to avoid problems here. Do not waste time with electrical tape, as it will heat up in the sun, slip, slide, and become "black gunk." Since the feedpoint impedance of a dipole is low but its end impedance is high, and since quarter wavelengths of transmission line invert impedances while half wavelengths repeat end impedances, I use a half- or full-wavelength feedline (measured from feedpoint to rig's PL-259). I found that length minimizes the need for a tuner. However, you can use an antenna tuner and any convenient length of feedline desired.

My second version of end-fed dipole utilizes a 6-turn and 6-inch-diameter coil of the RG-58 or RG-8X feedline to act as an RF choke and define the end of one dipole side (fig. 2). The coil or choke lets RF energy radiate from the shield between the feedpoint and the coil (and from the quarterwave section of hookup wire), but blocks or stops radiation between the coil and the rig. Since this antenna's main attraction is quick setup in a motel-type environment, the North Georgia QRPers (NoGaNauts) found the perfect coil former—an always-available spare roll of tissue paper. Jolly good show, gang!

My latest (Mark III?) version of end-fed dipole (fig. 3) uses three large computer-type snap-on toroid cores in lieu of the 6-turn coil to define the end of one side. This really makes on-the-spot assembly a piece of cake. Just measure three quarter-wavelengths, snap the toroids onto the coax/feedline, and slide them slightly up/down the feedline to tweak SWR and enjoy. Use the largest snap-on toroids you can find; they choke out the most RF energy. I am still dinking with this design,

*4941 Scenic View Drive, Birmingham, AL 35210
e-mail: <k4twj@cq-amateur-radio.com>

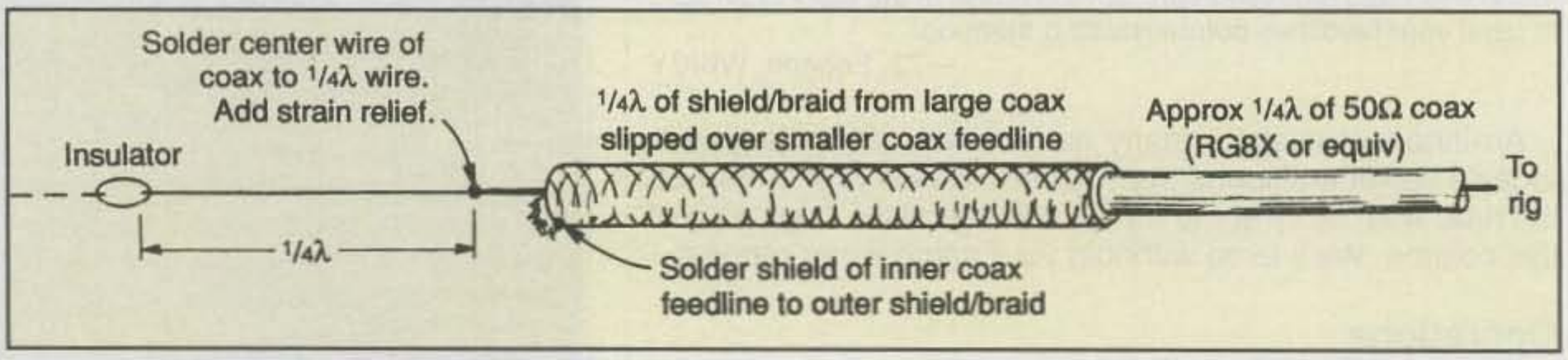

Fig. 1– This first version of end-fed dipole is made by slipping a quarterwave section of large-diameter shield or braid over part of the smaller diameter coax feedline as discussed in the text. Antenna may be installed vertically, horizontally, or sloping, as desired.

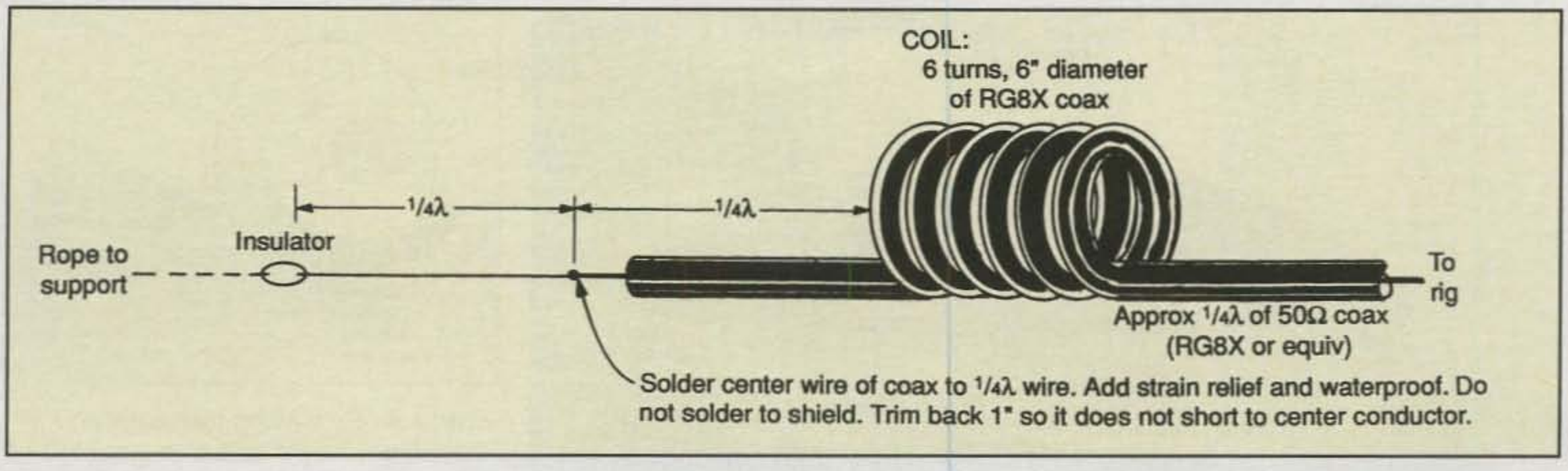

Fig. 2– This second version of end-fed dipole is made by winding the coax feedline into a 6-turn coil 6 inches in diameter and positioning the coil a quarter wavelength from the feedpoint. The coil acts like an RF choke, allowing the quarterwave "center to coil" section to radiate while minimizing feedline radiation. (Details in text.)

so try it at your own discretion and let me know how it works for you.

PAR's New EndFed Z

Going a couple of steps beyond the end-fed dipole concept (and achieving noticeably higher performance in the process) is the PAR Electronics recently introduced EndFed Z shown in photos A and B and fig. 4. This stealthy skywire is similar to a monoband version of today's popular half-wave or "no ground system required" verticals such as those produced by Cushcraft and Hy-Gain. The main differences are the PAR unit works without base radial rods and uses a full half-wave length of wire as a low-cost and barely visible radiator. It requires only one end support; it can be installed vertically, horizontally or sloping; and it works like a champ. It's a keeper!

Looking a bit closer, PAR's EndFed Z is made up of of a half-wavelength section of 136-strand Flexweave wire (neat stuff!) and an impedance converter box that matches the antenna's high/end feedpoint impedance to 50 ohms. You just plug in a 50 ohm feedline, quickly tweak wire length for lowest SWR, and you are ready for operation. Typical installation plus tweak time is usually less than 30 minutes. Prefer an even more quick-and-easy approach? Just forego the wire-length tweaking step (the worst-case SWR I have seen is only 1.7:1), punch on your automatic antenna tuner, and hit the air with a 1:1 SWR.

I checked out a PAR EndFed Z for 20 meters by installing the wire radiator in a "leaning vertical fashion" between a tree and the underside of a house eaves near my radio room. Using that layout I can stand on a deck rail, disconnect the wire radiator from its impedance matching box, and carry the box plus a (half-wave) roll of hookup wire and my FT-817 on weekend jaunts to the beach or the back woods. When returning home, I just reinstall the box, connect the wire and feedline, and I am back on the air in a flash. By selecting thin gray or black insulated wire to blend with the sky or trees, you can look almost directly at the antenna and not realize it is there.

I am constantly amazed at how well PAR's EndFed Z works out to U.S. and DX areas, especially while running only 5 watts. In fact, numerous in-QSO "antenna A versus antenna B" tests reveal it performs equal to my Hy-Gain AV-640 on 20 meters (remember, the EndFed Z is a monobander), and after using numerous verticals, I find the AV-640 is "top banana." I used the EndFed Z with my FT-817 during two recent QRP contests and realized an approximate 98-percent return on all calls (when you're hot, you're hot!). I could not believe the results, so I gave it a real test by switching over to my little MFJ Cub, and I still worked nine out of ten stations called. What a blast!

As of this writing, only 20 meter and upper-band Zs are available, but PAR was planning to introduce other/lower-band versions at Hamvention® 2003 in May, and I understand a multiband version is also under development. Want more details? Check with PAR Electronics, P.O. Box 645, Glenville, NC 28736; telephone 828-743-1338 or <www.parelectronics.com>.

The W5GI Collinear Multiband Antenna

Is your neighborhood is fairly receptive to allowing a low-profile antenna, and do you wish to install an extended-length, high-performance skywire for 80 through 6 meter operation? John Basilotto, W5GI, has an interesting new design worthy of consideration (fig. 5). It operates as three half-waves in phase with 5 or 6 dB gain on 20 meters and performs equal to or better than a G5RV on the other HF bands. Over 300 ama-

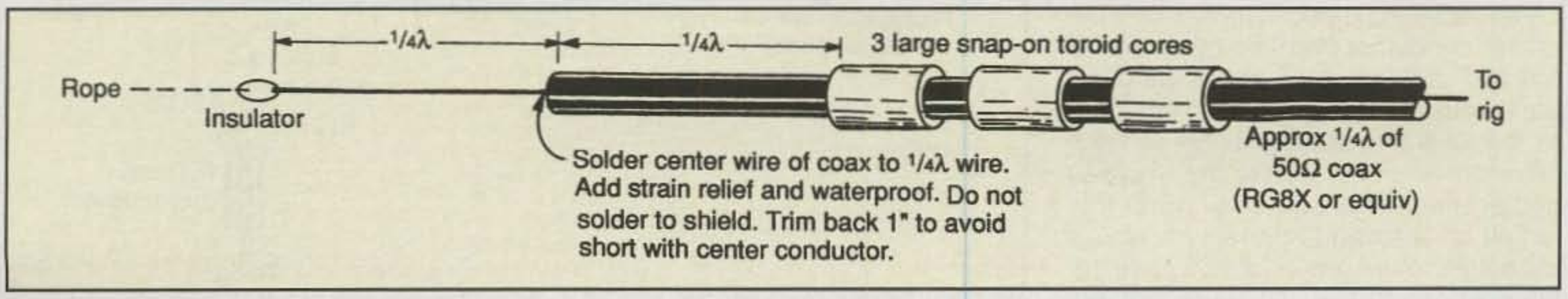

Fig. 3– This third version of end-fed dipole uses computer-type snap-on toroid cores in lieu of a 6-turn coil to isolate the feedline from the radiating shield of coax. SWR is tweaked by sliding toroids up/down the cable in 1 inch steps. I am still experimenting with and perfecting this latest version.

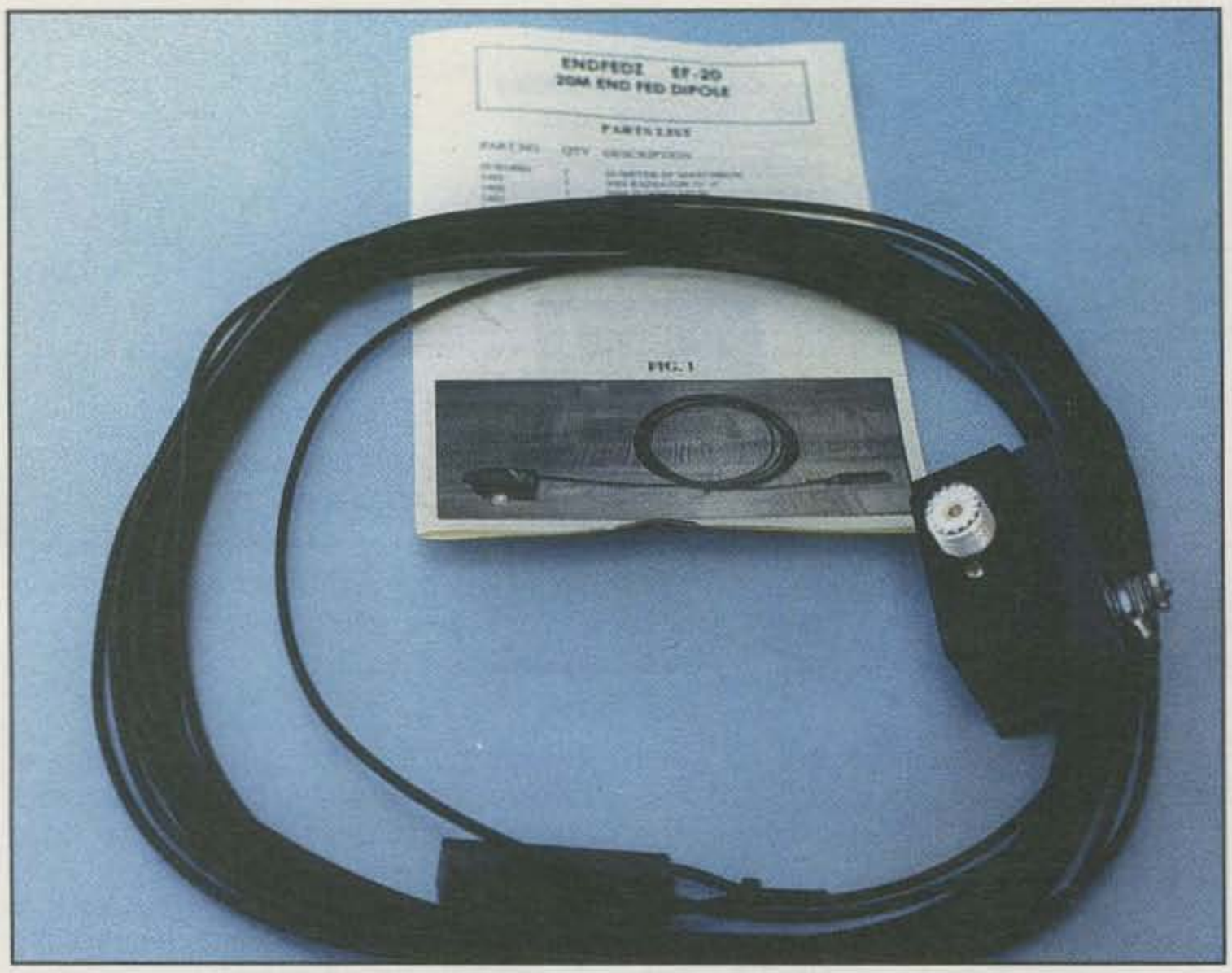

Photo A– The PAR Electronics EndFed Z half-wave antenna as received, unpacked, and ready for installation. Package consists of Flexweave wire radiator, impedance converter box with SO-239 for feedline, and instruction booklet. Black wire is barely visible when installed amidst trees or foliage.

Photo B– By leaving the supplied half-wavelength wire radiator installed at home and packing the impedance-matching box plus a substitute half-wave section of hookup wire, the PAR Electronics EndFed Z becomes a neat travel antenna for portable use. Box handles up to 100 watts and typically presents an SWR under 1.5:1 across a 300 kHz bandwidth.

teurs have built and used this antenna, and they all gave it two-thumbs-up approval for good performance. I also have one, and I find it works out comparable to my 3-element beam. That is quite a compliment for a low-cost and barely visible wire antenna. Yes, and if you live in a CC&R-limited apartment or condo adjacent to a semi-wooded area, this skywire will give you a new lease on (HF) life. W5GI wrote a full-length article on the antenna which was featured in last month's issue of *CQ*. If you don't have the July issue handy, you can use the following details to quickly brew one for use on the air right now.

Begin by cutting four lengths of wire and two lengths of RG-8X 50 ohm coax cable to precisely 16.5 feet each. Trim one inch of braid and one inch of center conductor from one end of both coax cable sections. Trim one inch of only the center conductor from the other end of the two coax cable sections (and cut back unused shield so it does not short to the center conductor). Solder one 16.5 foot length of wire to the exposed center conductor on one 16.5 foot length of coax and connect the wire's other end to the antenna's center insulator. Repeat those two steps to make the antennas "other side."

Next solder one of the remaining two 16.5 foot lengths of wire to both the exposed shield and center conductor on one side's coax cable and secure that wire's "far end" to an end insulator. Repeat those two steps to make the antenna's "other side." Solder a 34 foot, 7 inch length of 300 ohm twinlead to wires at the center insulator (14-gauge window-type works best; it is strong and not severely affected by rain). Solder 75 or more feet of RG-8X 50 ohm coax feedline to the 300 ohm twinlead, and route it to your rig and give it a go. The SWR will be around 1.6:1 on 20 meters, so use your antenna tuner for matching and enjoy resultant multiband operation. Need more details? See John's article on page 18 of last month's *CQ* or e-mail him at <w5gi@aol.com>.

Linear-Loaded Dipole Update

We received a number of e-mails regarding the linear-loaded, or shortened dipole highlighted in our November 2002 "How It Works" column (and our *CQ* e-mail dropped reply addresses), so let's briefly clear up some points of confusion.

First, the 50 ohm RG-8X coax feedline was accidentally printed with an extra zero and read "500 ohms" (gad!). Most folks saw through it, however, as RG-8X is only 50 ohm cable. Second, this antenna's shortened length results from folding back its elements, but it is not a folded dipole (a folded dipole is a full half-wave in length, its upper wire is not broken, and it is made of and fed with 300 ohm twinlead). Finally, 450 ohm "window-type" ladder line was

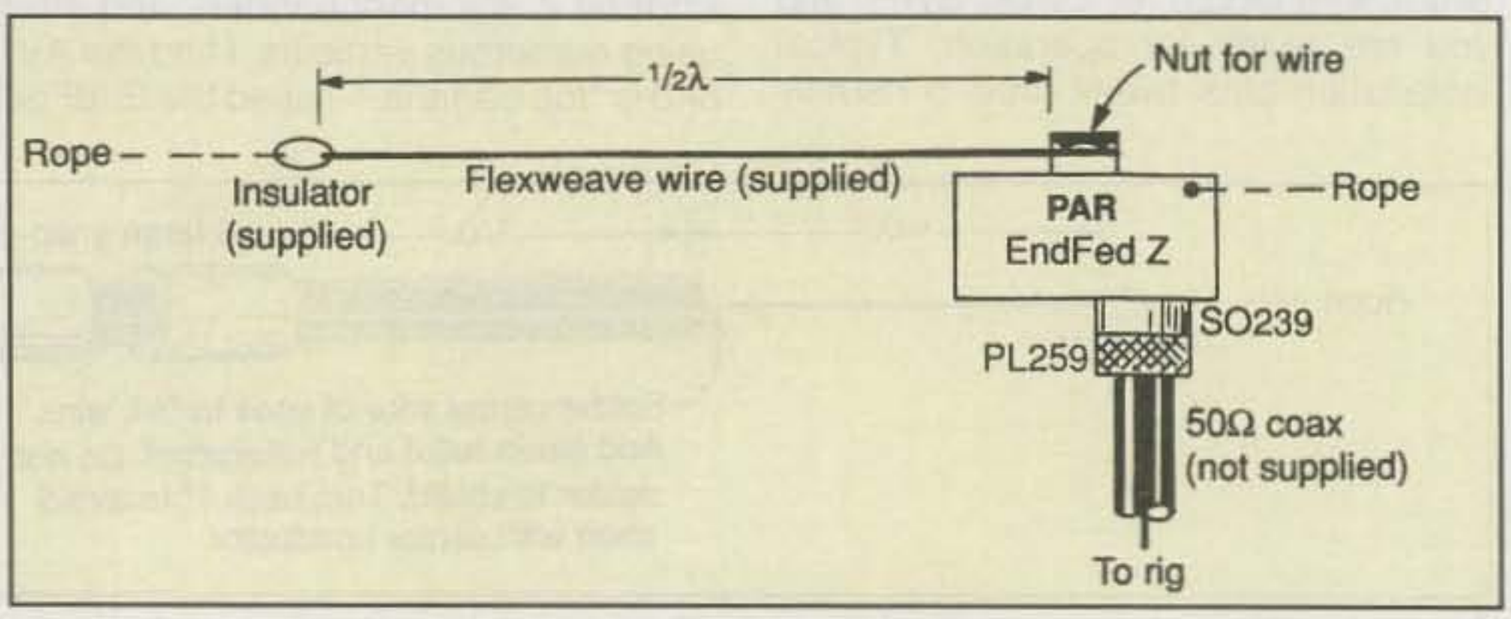

Fig. 4– Electrical outline of the PAR Electronics EndFed Z. Antenna is akin to a single-band and wire-radiator version of today's popular "no ground system required" verticals, and it works very well.

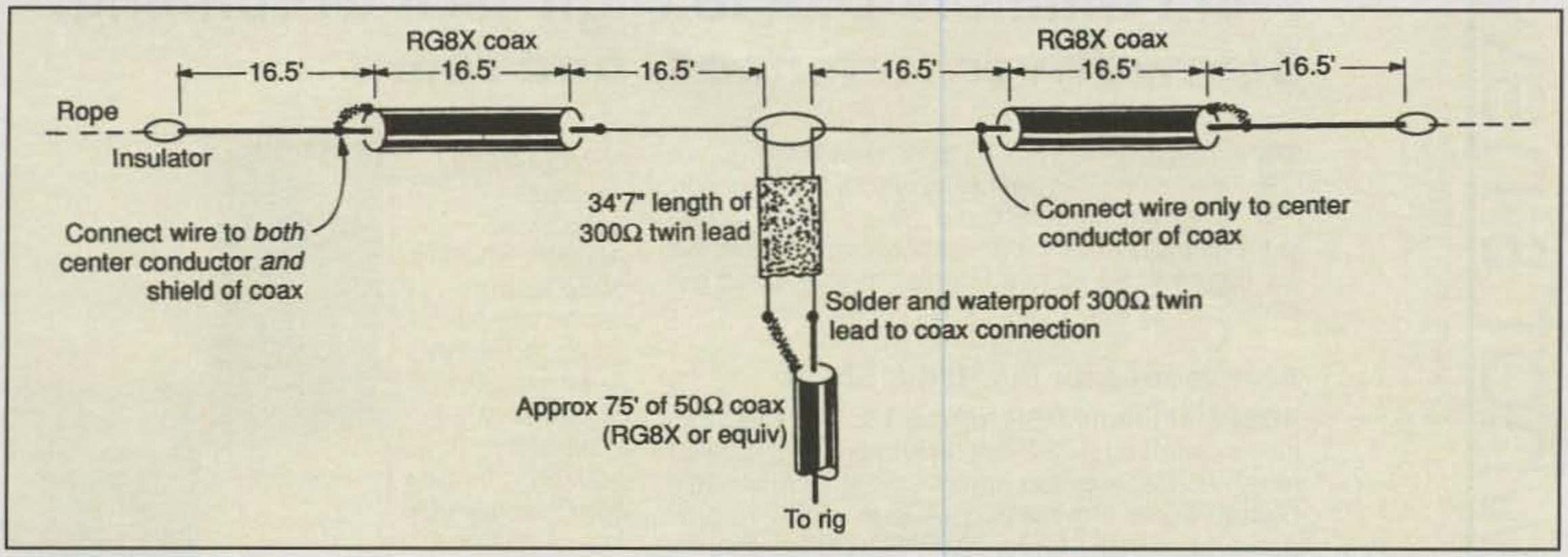

Fig. 5– Electrical outline of the W5GI Collinear Multiband Antenna, which covers 80 through 6 meters and is approximately 100 feet long. Maximum signal radiation and reception is broadside or at right angles to the wire (north and south, for example, if ends point east and west). (Additional details in text.)

60 Meter Antennas

Only a couple of hours before sending this column to *CQ*, we heard that the FCC had decided to release five 60 meter frequencies/channels for amateur radio use (5332, 5348, 5368, 5373, and 5405 kHz, USB, 2.8 kHz bandwidth, 50 watts ERP maximum). *[Note: Don't tune to these frequencies. See WB6NOA's operating guide elsewhere in this issue.—ed.]* These new frequencies became available on July 3.

All of the homebrew antennas in this month's column are easily scaled to operate 60 meters. You can also quickly convert a 30 or 40 meter delta loop to a 60 meter "bent-Vee" dipole by adding an insulator at its middle and trimming each resultant side to 43 ft. 9 in. The W5GI antenna can also be scaled to favor 60 meters by cutting each quarterwave wire section to (234/5.35 MHz = L [ft.]) 43 ft. 9 inches. Watch for more info and rig mods for 60 meters in upcoming columns. I will be listening for you on 60 meters! *—de K4TWJ*

used for assembly only because it was easy to find. Separating the wires with long (4 to 8 inch) spacers or "real ladderline" is fine—even preferable—and you can get them from W7FG manuals and ladder line at <www.w7fg.com> or telephone 1-800-807-6146 (wow—two classic tubes!). There's more.

This antenna's wires need not be turned back any more than necessary to fit your available space. If you plan to assemble a 40 meter version and you have two end supports 45 feet apart, for example, you can cut each side to 21 feet long and turn back 12 feet on each side. That equals 21 + 21 or 42 feet overall physical length and an electrical length of 66 feet.

One of the most interesting comments noted on this antenna came from Dave Thompson, K4JRB. Dave pointed out the antenna is similar to the classic MorGain Dual Band Dipole of eras past (Dave still has two, and really likes them). The MorGain has full-length elements on 40 meters and folded-back elements on 80/75 meters, resulting in a 66 foot long antenna that works both bands. Dave also found the formula 280/freq. (in MHz) = Length (in feet) works best when calculating overall length of required (window-type) ladder line. Thanks for the notes, Dave!

Conclusion

We're out of space for this month, friends, so have a ball dinking with antennas while the warm weather is with us and remember to enjoy some good QRP QSOs every day. That warrants repeating. Reading about QRP and exchanging e-mails about QRP cannot—I say again, *cannot*—compare with the exhilaration and joy of getting on the air and operating QRP. If we expect to keep our HF bands, we all—and that includes *you*—must use them.

73, Dave, K4TWJ

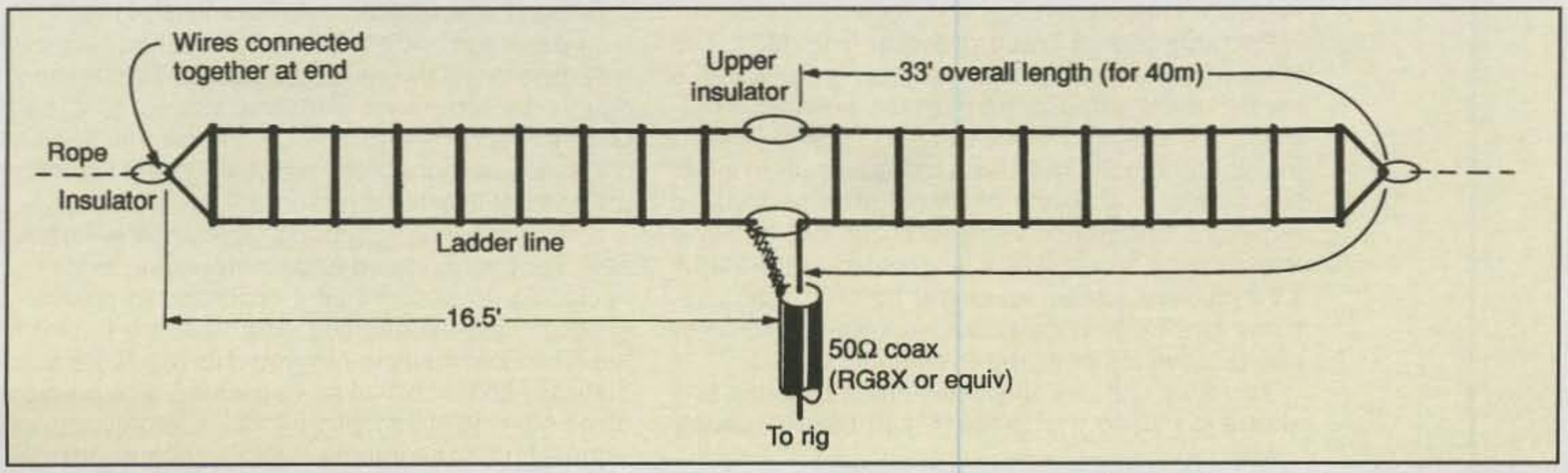

Fig. 6– The Linear-Loaded or "pint-size" dipole as featured in our November 2002 "How It Works" column. Antenna is a dipole with part of its length bent back to reduce physical length. Antenna is fed with 50 ohm coax. (Details in text.)

what's new

BY KARL T. THURBER, JR.,* W8FX

From Ultimate DSP to High-Tech Grounding, Screwdriver Antennas, and More

This month in your "What's New" column we shine the ever-bright *CQ* product spotlight on a variety of new radio shack accessories, antennas and antenna accessories, and net news we think will be of real interest to you. Let's get started.

Accessories for the Radio Shack

ADSP^2: Ultimate DSP from SGC, Inc. SGC Inc. has announced ADSP^2 , a technology that is billed as an unprecedented improvement in Automatic Digital Signal Processing (ADSP). SGC is now delivering ADSP^2 for its own SG2020 transceiver and as an add-on board (see photo A). The board is available in two versions, for nearly any transceiver, old or new, that meets minimal specs for the receiver audio circuits.

SGC pioneered ADSP over ten years ago, and asserts that ADSP^2 pushes ADSP performance to the limits of modern DSP technology. Internal IF-based DSP reportedly is incapable of matching the performance of ADSP^2 because it must devote some processor time to other tasks. ADSP^2 devotes all of its time to spectral noise reduction, and is said to yield unprecedented performance exceeding that available even in top-of-the-line transceivers.

SGC has tested ADSP^2 in many popular transceivers, including small portable units, and has found significant improvements in noise rejection on every unit evaluated. The ADSP^2 board adds two levels of ADSP processing and three narrow-band filters, giving the user significant flexibility in choosing the processing most appropriate to conditions.

The ADSP^2 boards are supplied ready for installation with only a few simple connections; full instructions are provided for various transceivers. Boards can be installed by the user or by a dealer or radios returned to SGC for installation. Additional information and pricing is available at the SGC website.

For more information, contact SGC Inc., 13737 SE 26th Street, Box 3526, Bellevue, WA 98009 (1-800-259-7331; e-mail: <sgc@sgcworld.com>; on the web: <http://www.sgcworld.com>).

Portable Signal Tracer/Injector from MFJ. The folks at MFJ Enterprises recently introduced a handy, multi-purpose ham shack service instrument. It's the MFJ-5012 Portable Signal Tracer/Injector (photo B). With it you can quickly find defective states in all kinds of signal amplifiers, radio receivers, and transceivers. You can delve deeply into amateur transceivers, shortwave and AM/FM/TV receivers, police scanners, home theater systems, amplifiers, public-address systems, cordless phones, cell phones, and even guitar amps.

You also can use the device to find opens and shorts in cables and wires; it can readily identify and locate individual wires in multi-conductor cables. As such, it's said to be ideal for troubleshooting and repairing cabling and wiring in computer networks, telephones, and sound systems—almost any system that uses wiring and cabling. The $79.95 unit accomplishes these tasks and functions with a harmonic-rich, variable-signal-level source, an AM detector, and a variable-gain audio amplifier.

For more information or a catalog, contact MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, MS 39759 (1-800-6471800; e-mail: <mfj@mfjenterprises.com>; on the web: <http://www.mfjenterprises.com>).

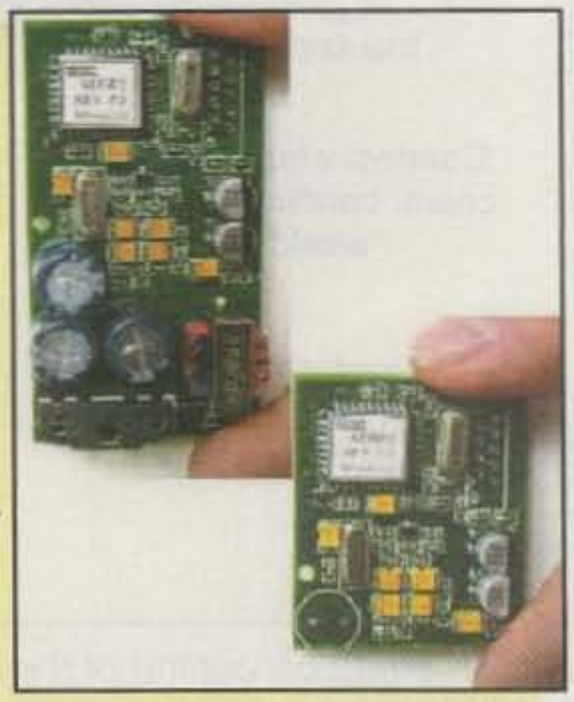

Photo A– SGC Inc. has announced ADSP^2, which is billed as an unprecedented improvement in Automatic Digital Signal Processing (ADSP). The new board is available in two versions, high and low power. The high-power version is for situations where it's necessary to bypass the transceiver's audio amplifier circuitry. (Photo courtesy SGC Inc.)

Antennas and Accessories

GM/MS Technology in New Device from Rabun Labs. Are you seriously concerned about your antenna and station grounding system? A new technology implementation from Rabun Labs is said to solve old and longstanding problems in grounding systems. The new Ground Monitoring and Maintenance System (GM/MS) senses soil resistivity and automatically keeps it low.

Rabun Labs, Inc., an innovator in UL-listed lightning-detection and equipment-protection systems, has developed the new technology. This technology is incorporated into the simple and safe GM/MS hardware (photo C), which functions to continuously monitor the resistivity of the soil in the area where a ground rod or system is located.

Simply measuring ground resistance is nothing new, but the real need once a grounding system is in place is to assure that it continues to provide a good ground—something which usually is forgotten. The GM/MS technology and its hardware automatically take action to solve the long-time problem of maintaining electrical grounds, automatically and without human intervention. While low ground resistance is foremost at all times to reduce noise and assure optimum equipment operation, the soil resistivity changes as natural evaporation of the

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e-mail: <w8fx@cq-amateur-radio.com>

Photo B– MFJ Enterprises recently introduced the MFJ-5012 Portable Signal Tracer/Injector. With it you can quickly find defective states in all kinds of gear. You also can use the device to find opens and shorts in cables and wires. The unit features a harmonic-rich, variable-signal-level source, an AM detector, and a variable-gain audio amplifier. (Photo courtesy MFJ Enterprises)

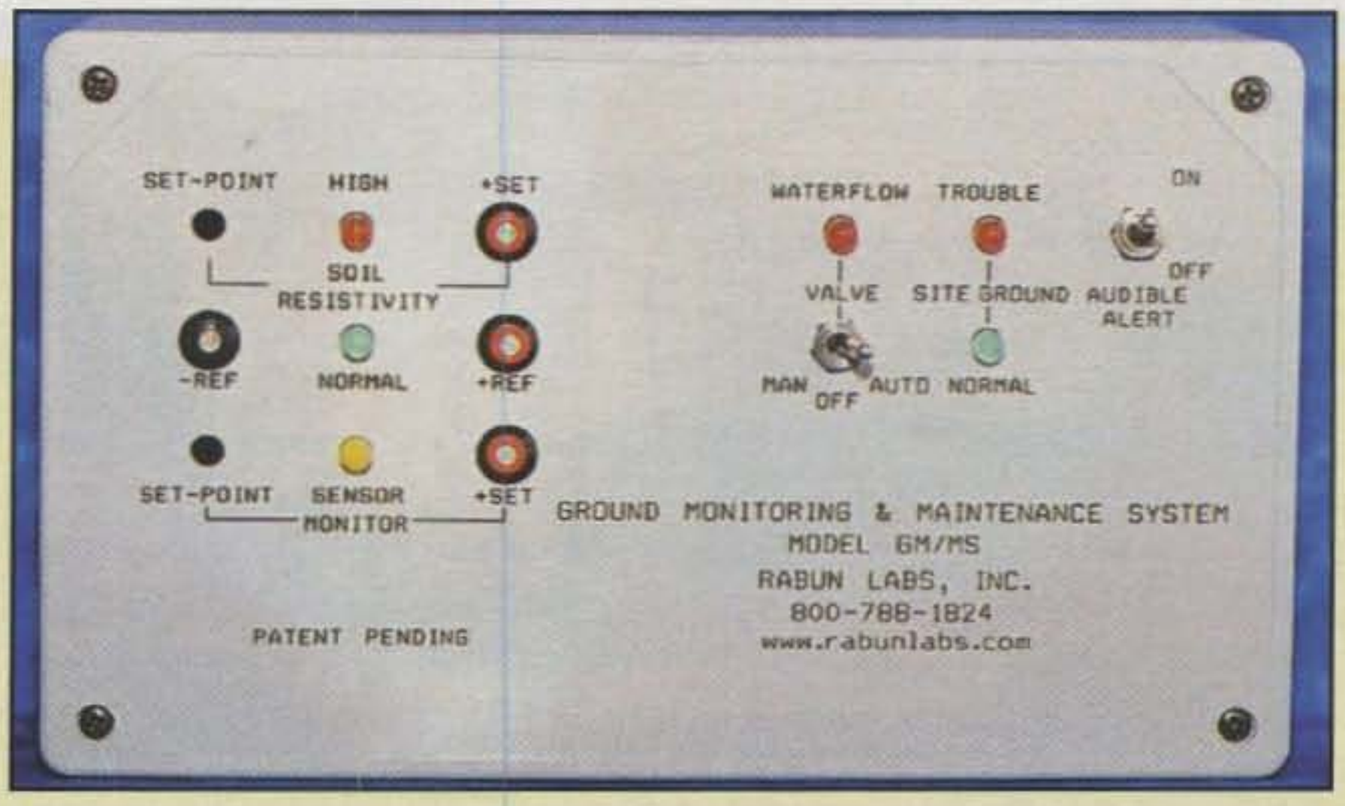

Photo C– The new Ground Monitoring and Maintenance System (GM/MS) from Rabun Labs, Inc. senses soil resistivity and automatically keeps it low. The hardware functions to continuously monitor the resistivity of the soil in the area where a ground rod or system is located. (Photo courtesy Rabun Labs)

moisture in the soil occurs. Unfortunately, this situation arises primarily in the summer months, when lightning is a concern and grounding is needed to be at its best.

When the soil resistivity rises above the site-selected "set-point," the GM/MS hardware activates a standard 24 VAC irrigation valve, causing the soil in the area of the grounding system to be gently soaked with environmentally friendly water until the resistivity falls below the "set-point." Then the system automatically resets and deactivates the valve. This action automatically maintains the soil resistivity, which in turn assures the ground-system resistance is maintained. The GM/MS hardware also provides a local visual alert when high resistivity is detected and the valve is energized. Dry contacts also are provided to interface with dialers or data systems for remote monitoring.

In addition to monitoring the soil resistivity, the GM/MS hardware also monitors the site electrical ground hardware to assure that equipment and/or AC outlets actually are connected to your site electrical ground. Should an anomaly be detected, the GM/MS hardware provides a local audible and visual alert as well as dry contacts for remote-reporting interfacing.

The GM/MS hardware does not connect to or in any way affect existing ground rods or systems. Instead, it has two dedicated "sense rods" that are installed in the area of the site grounding system to monitor the soil resistivity. The GM/MS hardware is housed in a wall-mounted, nonmetallic enclosure that measures 7.5" × 4.5" × 2.0". The hardware is list-priced at $499.95.

For more information, contact Rabun Labs, Inc., P.O. Box 1076, Mason, TX 76856 (1-800-788-1824; e-mail: <staff@rabunlabs.com>; on the web: <http://www.rabunlabs.com>). A great deal of information on the new technology and the hardware, including a GM/MS block diagram, is available on the website.

New Tuners from LDG Electronics. Over the past few years we have noted several impressive products from Dwayne Kincaid, WD8OYG, of LDG Electronics. Recently, Dwayne sent us information on one of his new tuners, which announces the start of a new line of high-tech tuners that will tune from memory. He says that over the next few months he'll announce "lots of cool new products."

For the moment, we'll just take note of LDG's new-breed tuner for the Ten-Tec Pegasus HF transceiver, the Model PT-11P (photo D). The PT-11P mounts internally into the Pegasus radio and receives commands from the user's radio control software running on a Windows®-based PC. The new tuner is user installable with just eight solder connections.

The PT-11P tuner features 240 memories, providing enough bandwidth to have saved memories for the entire amateur spectrum on HF. Supporting software recognizes previously tuned frequency ranges and will recall tuner settings. The tuner operates with an SWR range of 10:1 or less, over 1.8 to 30 MHz, and it handles 100 watts. Initial tuning time is approximately 3 seconds, and 20 milliseconds for subsequent recalls.

The PT-11P is assembled and tested, and it installs in about 30 minutes. The mounting bracket measures 9.7" × 5" × 1.5", and the weight is approximately 1.5 lbs. The PT-11P retails for $199.00 plus shipping.

Contact LDG Electronics, 1445 Parran Road, St. Leonard, MD 20685 (phone 410-586-2177; e-mail: <ldg@ldgelectronics.com>; on the web: <http://www.ldgelectronics.com>).

Ameritron SDA-100 HF Mobile Screwdriver Antenna. While we have covered MFJ Enterprises' products many times in this column, we should also mention that the "MFJ family" also includes Hy-Gain, Ameritron, Vectronics, and Mirage. Now we'll take note of the Ameritron SDA-100 HF Mobile Screwdriver Antenna.

According to Ameritron, the new SDA-100 (photo E) when properly installed on your vehicle will provide continuous coverage from 10 through 80 meters or from 6 through 40 meters, depending on whip configuration.

Ameritron says that the hallmark of their antenna line is the top-quality construction, which features blueprinted, machined components of either aircraft aluminum or stainless steel. The antenna's coil form is about 2 inches in diameter and made of fiberglass; 14-gauge wire is used for high-power capability. A new, super-heavy-duty Pittman com-

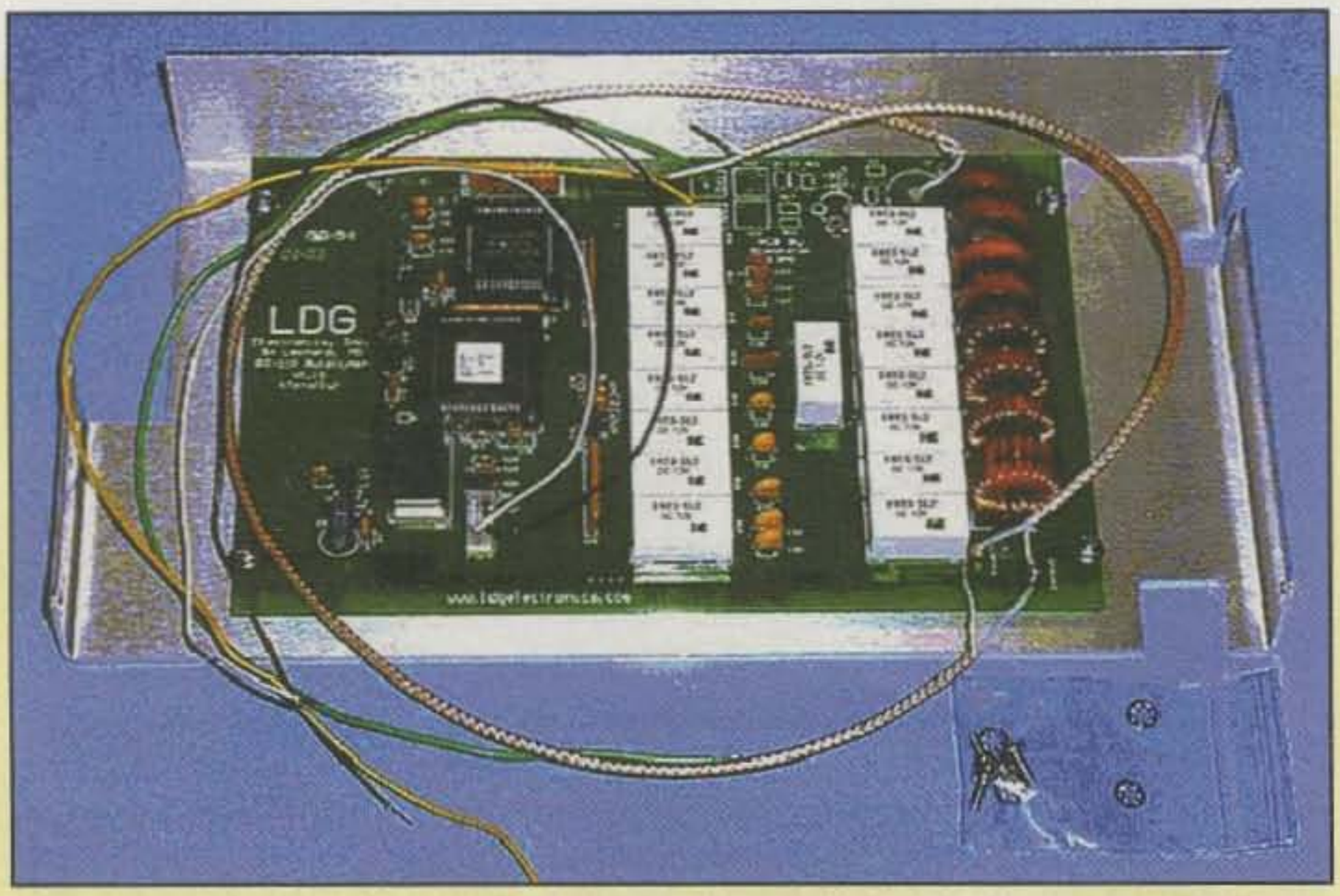

Photo D– The new-breed LDG Electronics tuner for the Ten-Tec Pegasus HF transceiver is the Model PT-11P, which is shown here installed in a Pegasus. The PT-11P mounts internally and receives commands from the user's radio-control software running on a Windows®-based PC. (Photo courtesy LDG Electronics)

mercial 12-volt gear motor is very durable and also very quiet while receive-tuning. The design lets you run up to 1.2 KW PEP trouble-free.

The SDA-100, with its handsome black finish, carries a suggested retail price of $325. It includes the up/down switch controller, motor DC cable with detachable weather-sealed connector, and decoupling toroid matching coils. Options include a stainless-base-flange mounting bracket and a 6 foot stainless whip to fit the SDA-100.

Contact Ameritron, 116 Willow Road, Starkville, MS 39759 (1-800-713-3550; e-mail: <ameritron@ameritron.com>; web: <http://www.ameritron.com>).

Guy-Site from Force 12. For more than 12 years Force 12 has offered several lines of high-quality amateur and commercial antennas and towers. These products include the Sigma© series verticals, the Magnum series Yagi beams, flag poles and flag pole antennas, towers and trailers, and powered masts.

Recently, proprietor Tom Schiller, N6BT, told *CQ* about an interesting, handy, and inexpensive device the firm markets. It's the Guy-Site© (photo F) for use in installing guy wires on masts and towers. The Guy-Site is a unique tool to assist in properly locating three guy points at 120 degrees for tubular masts and other items requiring guy lines. The device attaches to tubes from 3/4 inch to 2 inches in diameter. The Guy-Site also can be attached to other structures, and it may be placed on the ground. For larger Guy-Sites, contact the manufacturer directly.

Tom says that the device is a tool that everyone needs, in that its use means you no longer have to guess at the proper angles for installing guy lines. As such, it's said to be perfect for portable, Field Day, and home use. Its price is just $19.95.

Contact Force 12, Inc., P.O. Box 1349, Paso Robles, CA 93447 (1-800-248-1985; e-mail: <force12e@lightlink.com>; on the web: <www.force12inc.com>). Check out the Force 12 site. You'll find that it offers viewable and downloadable product brochures, tech tips, articles, antenna specifications, and considerably more.

New Antennas from Barker & Williamson. Barker & Williamson has expanded and reengineered its popular line of folded dipoles for military, emergency operations, and amateurs. While retaining the same look as the units being replaced, the new antennas offered in the BWD series (which we first noted in the April column) now feature operation up to 6 meters on all antennas, automatic bleed-off of wind and thunderstorm-induced static, and exceptionally quiet receive operation. Also, new, shorter models are available to fit inside attics, as is a longer one for enhanced 160 meter operation.

All BWD units come with 14-gauge stranded Copperweld© wire; the same antennas are available in the BWDS series with 14-gauge stranded stainless-steel wire. The antennas allow true broadband operation on HF with SWR of 2:1 or better (3:1 or better for 6 meters). This broadband capability allows operation of most radios without an external tuner. Power handling is 2 KW PEP CW/SSB ICAS (Intermittent Commercial and Amateur Service). Antennas come completely assembled and ready to install.

Antenna mounting is accomplished in flat-top, inverted-Vee, or sloper configurations. The FDMK mounting kit (photo G), priced at $39, is available to hold the center components.

Contact Barker & Williamson, 603 Cidco Road, Cocoa, FL 32926 (phone 321-639-1510; e-mail: <custsrvc@bwantennas.com>; on the web: <http://www.bwantennas.com>).

New on the Net

EIMAC Power Tube Reference Manual Online. The Eimac division of Communications & Power Industries (CPI) has posted the classic *Care and Feeding of Power Grid Tubes* reference book on its website at <http://www.eimac.com>. Covering device fundamentals and theory, equipment design considerations, and applications information, this book is considered by many

Photo E– The new Ameritron SDA-100 HF Mobile Screwdriver Antenna is shown here road-ready. When properly installed, the antenna will provide continuous coverage from 10 through 80 meters or from 6 through 40 meters, depending on whip configuration. See the column for details. (Photo courtesy Ameritron)

Photo F– The Guy-Site© tool is for use in installing masts and towers. The simple device, shown here, means you no longer have to guess at the angles for guy lines. The versatile Guy-Site device attaches quickly to masts from 3/4 to 2 inches in diameter. (Photo from the Force 12 website)

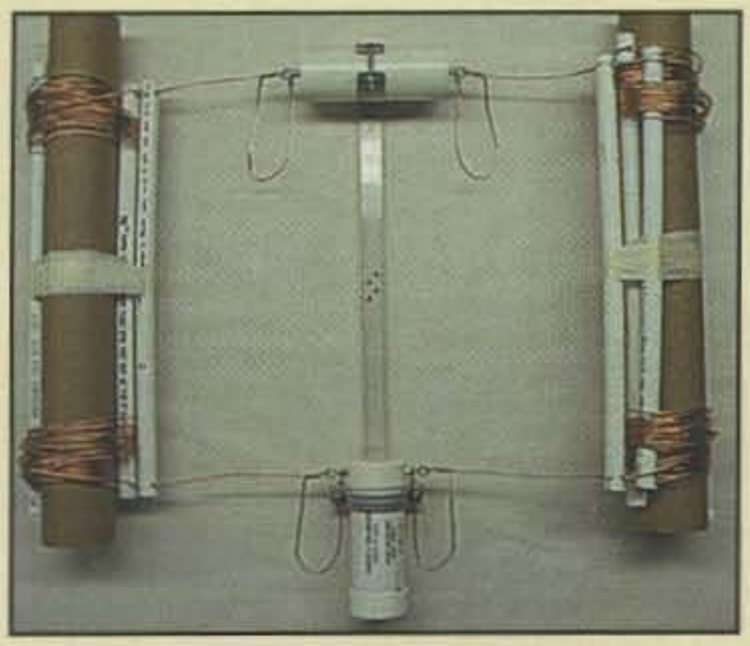

Photo G– A Barker & Williamson folded dipole antenna is shown rolled up with the optional FDMK mounting kit attached. The accessory allows easy permanent or pulley mounting of the company's line of folded dipole antennas. (Photo courtesy Barker & Williamson)

to be the essential reference work in the tube industry.

The *Care and Feeding* book has been a valued resource within the tube community for years, even though it is out of print. The current posting in the Acrobat Portable Document Format (PDF) includes many updates, including an all-new section on Inductive Output Tubes, or IOTs. According to John Allan, Eimac's Vice President of Marketing, "The Eimac staff have additional updates to be added before we take this new edition to print, which we hope to do later this year. By making it electronically available immediately, even as we continue with our update, we are responding to the numerous requests for this book."

The Eimac division of CPI is a leading producer of power grid tubes and IOTs for radio and television broadcasting, as well as for industrial heating, semiconductor wafer processing, radar, medical, and scientific applications. CPI is a leader in advanced transmission technology for satellite and terrestrial communications, radar, electronic warfare, industrial processing, medical diagnostics, and scientific research. You can view the corporate profile at <http://www.cpii.com>.

Antique and Vintage Electronics Exchange at RadioSwapMeet.com. RadioSwapMeet.com, Inc. has announced the startup of its new website which focuses on the antique and vintage electronics marketplace. The Southampton, Pennsylvania based website's focus is on anything electronic made before 1975.

The website's concept is unique, as sellers buy "tables" as in a real swap-meet or flea-market environment instead of single listings as in other online platforms. Sellers also can allow table items to be auctioned off. The website's primary goal is to have a friendly common market for members of the many radio and electronics clubs around the world. The public also is invited to participate in buying and selling.

Current online trading venues often miss the mark by lack of customer support and involvement. RadioSwapMeet.com plans to overcome these shortcomings and fully support radio clubs by sponsoring events, advertising, and promoting the clubs on the site. Discounts are also offered to participating clubs' members as well as donations to the clubs based on their members' activity on the site.

RadioSwapMeet.com is a newly formed, privately owned corporation. Its founders are experienced computer engineers who have interest in antique radios. Website spokesman Dan Collins plans on personally speaking at club meetings around the country to promote this site and explain its benefits. Future plans include international expansion.

Contact Dan at RadioSwapMeet.com, Inc. (phone 215-364-1150; e-mail: <support@radioswapmeet.com>; on the web: <http://www.radioswapmeet.com>). Check out the website!

Wrap-Up

That's all for this time, gang. Next time more "What's New." See you then.

Overheard: Whether in amateur radio or in life as a whole, the majority of "good things" tend to happen unexpectedly.

73, Karl, W8FX

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digital connection

BY DON ROTOLO,* N2IRZ

PSK31—The Whys and Hows

The digital revolution is upon us. As I mentioned in June, we're just at the leading edge of a major upheaval in amateur radio, one in which digital communication techniques will grow in prominence and effect. Lucky you, you're in the game at just the right time!

It seems, according to common wisdom, that fewer hams are experimenting these days. With the advent of integrated circuits, and more recently high-density surface-mount components, it's becoming more and more difficult to find anyone who builds things today. I believe common wisdom is wrong. I submit that there is more experimentation and innovation going on in amateur radio today than at any other time in history, but there may not be much molten solder involved. I'm talking about software.

Hams are experimenting all over the place, with PC sound-card DSP (digital signal processing), new operating modes, and the next big thing, software-defined radios. I'm really excited about SDRs, especially after hearing Gerald Youngblood, AC5OG, speak at the TAPR PacketBash in Dayton during the Hamvention®. I caught a glimpse of the awesome potential of these radios, and I'm anxious to share that with you. However, in June I promised a look at PSK31, and so that's what we'll do this time.

PSK31 isn't all that new. You've probably heard about it and most likely read an article or two on how to get started. You might even operate PSK31 (If you do, please accept my apology, as the rest of this column will seem a bit basic). This month we'll take a look at PSK31 from the point of view of a rank beginner—what it is, why it's cool, and how to get on the air.

What is PSK31?

The short answer to the question is "a digital HF mode best suited to live keyboard-to-keyboard discussions." The slightly longer answer will look at each part of that short answer.

PSK31 is a digital HF mode. It uses digital techniques, most notably digital signal processing, to wring every last bit out of a radio signal. Instead of sending an analog signal, such as your voice, it sends a bunch of ones and zeros, which are used to depict the written alphabet. While it's also best suited for HF frequencies, because of its very narrow bandwidth and resistance to noise and the vagaries of HF propagation, there's no reason it couldn't be used on, say, 2 meters or 10 GHz. Matter of fact, I bet it would be a huge improvement over CW on those frequencies.

Why do I say that it's best suited to live keyboard QSOs? Because while we're sending data here, there's little in the system to ensure error-free reception. If you want to send a data file, you're better off with some other digital modes. If you can tolerate some bad copy, then PSK31 is just fine. It's not that you'll see much bad copy—as you'll learn in just a few paragraphs—but data files are much more sensitive to that kind of thing.

Also, unlike some modes (such as packet), you don't actually establish a connection with the other station, so there's no guarantees of getting all the data. On the other hand, this makes it as easy to listen in or join a QSO as it is with voice. PSK31 is also well suited to roundtable- or net-type communications, again because no formal "connection" is made between two stations.

Why Is It So Cool?

Many years ago, I lost interest in HF. I really enjoy talking to people, and found that most of my QSOs on HF were like a DX or contest exchange—20 seconds and it's over. I wanted to ragchew, and these guys almost seemed afraid to. Oh, sure, there were a few folks out there willing to spend an hour or more in conversation, but they seemed to be the exception.

Now if you also enjoy talking with people, learning about them, and maybe sharing a little about

*P.O. Box 114, Park Ridge, NJ 07656
e-mail: <n2irz@cq-amateur-radio.com>

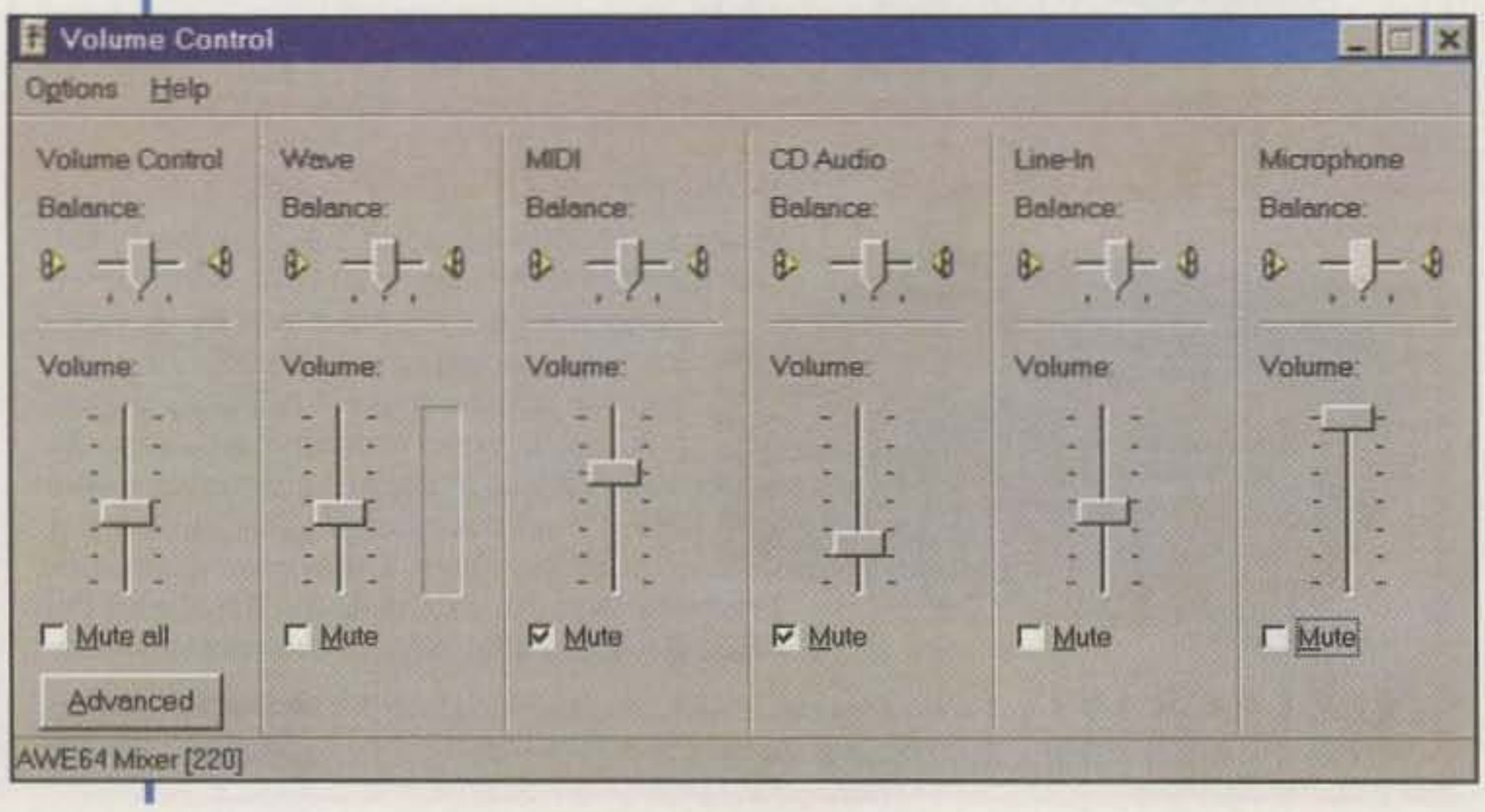

Fig. 1. The sound-card control panel. Open it by double-clicking the little speaker icon in the system tray. It is absolutely essential that you adjust the audio properly. This shows the PC's microphone enabled, for our little "wireless experiment," but normally it should be muted.

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yourself as well, then you probably enjoy a pleasant ragchew now and then. However, if you're the kind who is a little bit afraid of a long QSO—you know, conversation doesn't come easily for everyone—then maybe you need a small safety net. Either way, PSK31 was developed just for you.

The somewhat diminished intimacy of a keyboard QSO, as compared to voice, helps many hams with these issues. If you have the microphone jitters, then a keyboard mode is no different from a chat room, or maybe a fast e-mail system. You just type, and the other station responds. The PSK31 signal goes about as fast as a good typist, maybe 45 words per minute, so there's little time lag. If, on the other hand, you're looking for longer exchanges, you'll find that keyboard QSOs tend to be longer than SSB contacts. I'm not sure why this is so—perhaps we're more comfortable with written communications, or are more used to typing long letters—but nonetheless, it seems that ragchewing is alive and well on PSK31.

Of course, there's also the technical cool factor. Here we are, using a mode made possible only by the awesome power of our computers and sound cards. Signals can be copied from under the noise using far less bandwidth than CW, and (best of all) the software's free.

How to Get On The Air

Before taking that first step, you need to make sure you have the basic equipment: a transceiver that can tune in SSB signals, and a computer with a sound card, all located near one another. That's about it. While a sound-card-to-radio interface box might be handy, it's not an absolute necessity. The radio needs to be able to tune in an SSB signal, ideally the upper sideband (USB), but the software can compensate if LSB is all you have. The computer needs to have at least a 100 MHz Pentium-class processor and a SoundBlaster compatible sound card (most are).

The first step is to get some PSK31 software. There are a lot of possibilities out there (just Google "PSK31" and you'll see what I mean), but the one I'm recommending today is DigiPan, which runs under Windows®. It is real freeware, small enough to fit on a floppy, and very easy to install and use. If you have an internet connection, just go to <http://www.pavane.net/digipan/digipan.htm> to download a copy. If you can't get a copy that way (or maybe through a friend, or the local library's internet system), send me a dollar and I'll send you a copy on a PC-formatted HD 3.5 inch floppy.

Although DigiPan is my personal favorite, that doesn't mean it will be your favorite, too. Please, look around at what else is out there, try them, and arrive at your own conclusion. I'll say it again: There's a lot out there. Even DX4Win, the popular logging program, includes a PSK31 module.

Installation, which runs with a Wizard, is simple. Just run the Digipan6.exe (or the latest version) file, and it will self-extract to the Windows®/Program Files directory. Run the program from the Start menu or from the desktop shortcut.

Suggested Operating Frequencies For PSK31

While not part of any official band plan, you'll find the majority of the PSK31 activity around 150 Hz above the start of the IARU RTTY band plan (except 10 meters, to allow Novice participation). Specifically, look around 1838.15, 3580.15, 7080.15 (7035.15 outside Region 2, the Americas), 10142.15, 14070.15, 18100.15, 21080.15, 24920.15, and 28120.15.

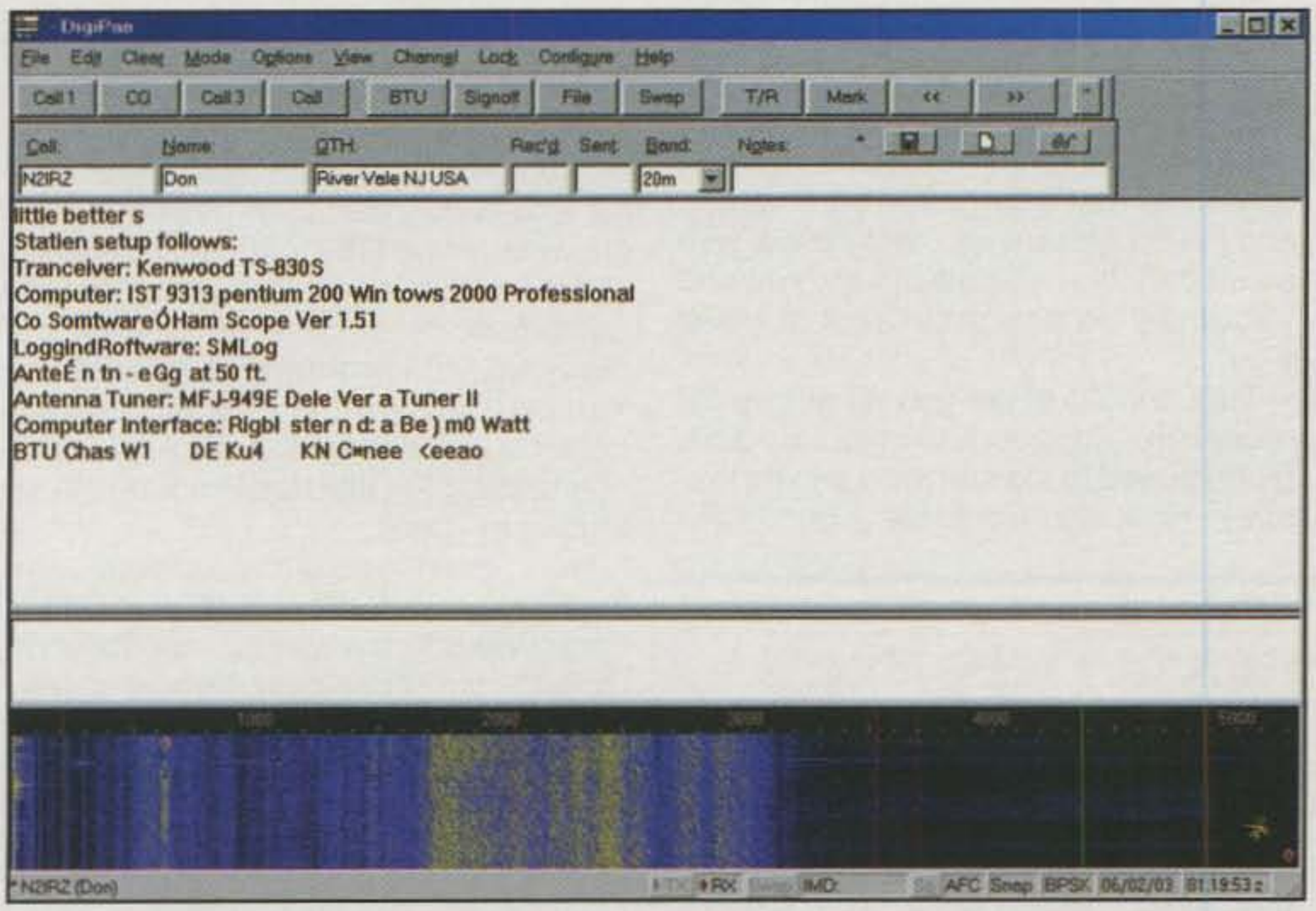

Fig. 2– DigiPan's main operating screen, shown during the "wireless experiment" (see text). The "waterfall" display at the bottom shows audio frequency from left to right, and intensity (loudness) as lighter colors. Time is shown on the vertical axis, and the display is constantly moving "down" with the latest data. It looks like a slow waterfall, hence the name. Note the received text in the upper window, which I received from the "green caterpillar" just above 600 Hz. The signals from about 1700 to 2500 Hz were ambient noise in the room from the TV. (Signal strength and copy accuracy are much better when the rig's audio output is plugged directly into the sound card.)

A "Wireless" Experiment

Here's a neat experiment to try, one which will demonstrate the simplicity and robustness of this mode and get you receiving PSK31 in a matter of seconds. Tune for a PSK31 signal (search on your favorite band; see the sidebar for common frequencies), switch on your sound card's microphone, and watch DigiPan decode the PSK31 signal. Yup, it's that simple.

If you're not familiar with your sound card's controls (fig. 1), open the sound mixer with a double-click on the little speaker icon in the system tray, down in the lower right corner of your screen. Enable the microphone (assuming you have one!) and turn the gain up. Set the radio's volume loud enough so that the sound card can hear it (usually a comfortable level, not too loud), and look for the characteristic "green caterpillar" on the DigiPan 'waterfall' display (fig. 2). Click on the best "caterpillar," and the Receive window should start showing you the decoded text. (If nothing happens, check the Options menu and ensure that RX is enabled, shown by a checkmark).

Tuning in a PSK31 signal isn't difficult. It sounds like very fast CW, or maybe RTTY without a rhythm. With the

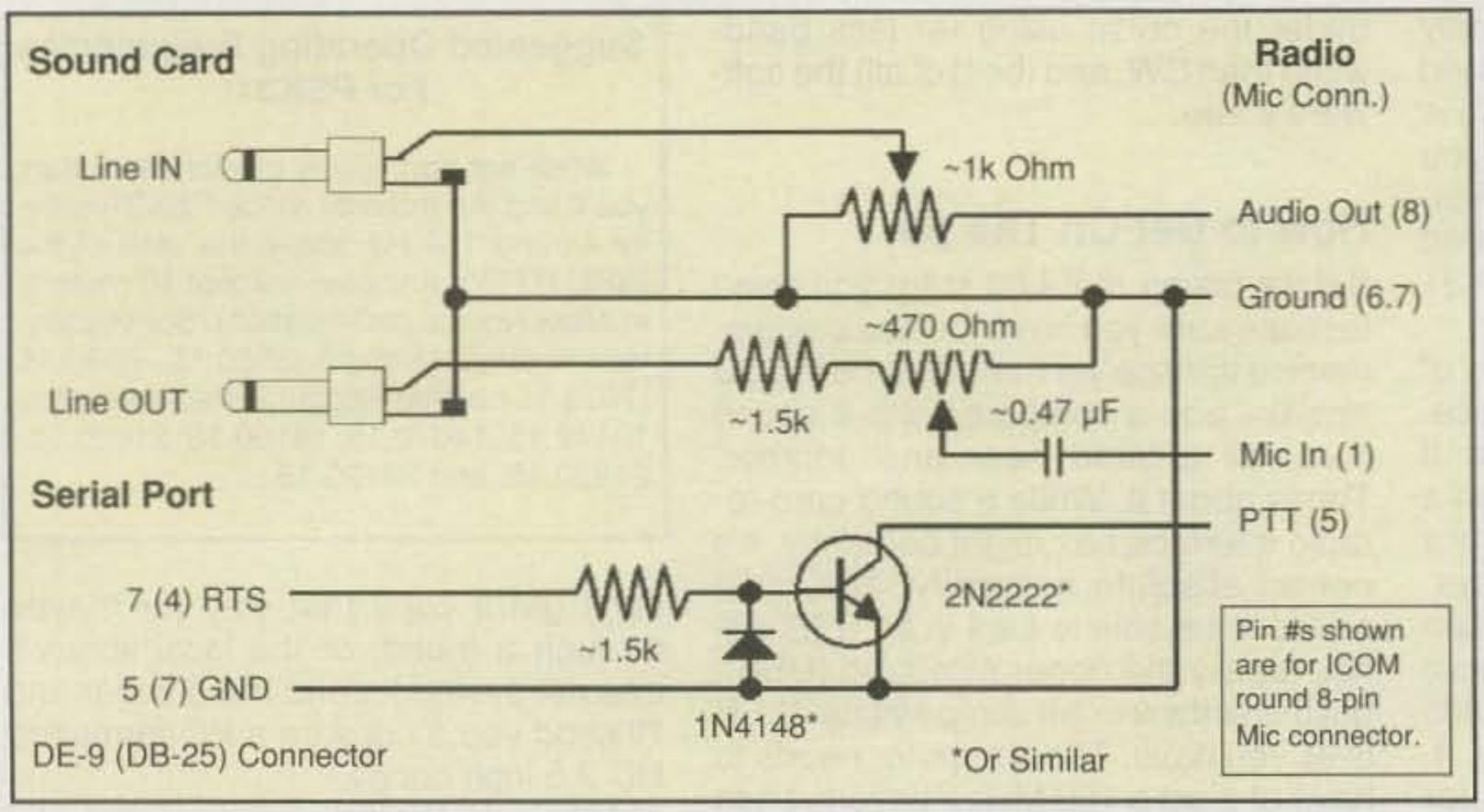

Fig. 3– Wiring for a basic interface cable. Your radio's microphone connector should have all the signals you need, but you might have to use the headphone jack for the Line In signal. You can build an interface like this for your radio and sound card using common parts. Nothing is critical, but make sure the output of the sound card is reduced sufficiently (see text). You can also buy a kit or ready-made interface box, so you don't have to unplug wires to operate other modes.

receiver in USB, just tune around until your hear something. You really don't even have to be all that close. Then use DigiPan to select the specific signal (just click on it), and it will use AFC to lock on. Even with room noise, and the speaker-to-microphone conversion distortions, you still get good copy. Amazing, that's what it is.

Let's Get Wired

Okay, now that our little experiment has shown how easy it is to receive PSK31, *even through the microphone,* let's make up some cables and do this the right way. Fig. 3 shows a basic sound-card-to-radio interface. To start with, try to get the radio audio output into the sound card. If your radio has a fixed-level sound output, which doesn't vary with the volume control, use that. You can also use the speaker or headphone output; just keep the volume low at the start. Connect the sound output of the radio to the "Line In" jack of the sound card.

Now go back to the sound-card controls (fig. 1), disable (mute) the microphone, and enable the Line In source. With DigiPan running, adjust the 1k potentiometer and the mixer's Line In control so that signals are bright green and the background is mostly black with some dark blue. Signals in the red and yellow are too strong; cut back the level a bit.

That should leave you all set up for reception. I suggest tuning around a bit, getting used to the software and its features. Now also would be a good time to read through the Help file. It isn't that long, and it contains many useful hints for operating. Also, before you start transmitting, configure the software (just scroll through the Configure menu and fill in the blanks; also check the Options menu to enable TX).

Once you're familiar enough with the software functions and settings, make up a transmit cable. For this you need both an RS-232 cable, to key your radio's PTT line (which works better than relying on VOX), and an audio cable, both connected to the microphone input.

The audio output cable (Line Out) is really important. If you try to drive your radio with the raw sound-card output, bad things will happen. The sound-card output is way too much (maybe a few hundred millivolts or more) for the radio's microphone input, which expects maybe 10 millivolts. The resistive attenuator (500k potentiometer) shown should be adjusted for minimum signal, then work your way up slowly. You can then fine tune the signal level with the sound card's output-level control. Set it so you don't overmodulate.

With the cables assembled and connected, and everything else in place, call CQ and see what happens!

The Easier Way

If you're not handy with a soldering iron, are looking for something more versatile and convenient than having to juggle wires every time you switch modes, or are just looking for the top-of-the-line equipment, then consider one of the many sound-card-to-radio interfaces. You can get them in every price range, from K8CCA's kit for $15 on eBay to the outstanding RIGblaster Pro from West Mountain Radio.

Here, listed in no particular order, are the ones you should probably look into. Each one offers a way to connect your radio to your sound card. In most cases, you connect everything once and leave it that way, using switches to set the mode. If you operate in more than one mode, you'll appreciate the flexibility. Most offer transformer or optically isolated inputs and outputs to protect your radio and sound card from evil surges. Functions abound, so read the reviews (In *CQ, QST,* and online), visit the manufacturers' websites, and decide for yourself which one best meets your needs.

• West Mountain Radio RIGblaster series. A number of choices, from the bargain-priced Nomic model (No Mic—

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YAESU ALINCO
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LDG * MAHA * ANLI * RANGER * YAESU * PRYME
AMATEUR RADIO - SCANNERS - BOOKS - ANTENNAS -
FILTERS - MOUNTS - ACCESSORIES & MORE
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Closed Sunday & Monday NO CATALOGS
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(201)-VHF-2067
114 Essex Street Lodi, NJ 07644
web site: www.advancedspecialties.net

get it?) to the all-inclusive Pro. Excellent manuals, an enthusiastic support team. <http://www.westmountainradio.com/RIGblaster.htm>

• MFJ has interfaces as well, from a good-quality, basic box to the "ultimate sound card interface." Professional quality manuals and the MFJ name to back them up. <http://www.mfjenterprises.com/products.php?catid=155>

• TimeWave, the PK-232 folks, introduced their HamHub model at Dayton this year, a high-end, do-it-all interface box. Look for availability in the fall. Also offered are PSK upgrades for the PK-232 and PK-900 models. <http://www.timewave.com>

• Buck Rogers, K4ABT's RASCAL series. The new RASCAL Mark V plus is a basic interface box for all sound-card modes, and there is a wide selection of cables to fit your radio, even some older models. <http://www.packetradio.com/>

If you just look around, there are dozens of other entries into this market. I apologize in advance to any manufacturers whom I have inadvertently omitted, and encourage them to contact me with more information. A comment on the West Mountain Radio products: Their user manuals are by far the best of the bunch; they are extraordinarily detailed and very thorough. Also a comment on Timewave: Long-time readers know that my only on-air interface is my trusty old AEA PK-232, one of the very first built. I've kept up with the upgrades along the way—DCD, MBX, DSP—and I picked up their new PSK upgrade at Dayton. Once I get it installed, I'll let you know what I've learned.

There you have it, PSK31 in a nutshell. It really is as easy as it sounds, and once you try it I guarantee you'll be hooked. With no investment at all, just try my little wireless experiment. I think that will convince you to make up the cables, or buy an interface, and explore this exciting mode. It may not be that new, but far too many of us haven't tried it yet.

DCC 2003

If you live within driving distance of ARRL HQ—that is, anywhere from New England to Virginia—you really should make the effort to participate in the ARRL/TAPR Digital Communications Conference, being held September 19–21 in Hartford, Connecticut (see sidebar). Everything that I write about, and much, much more, will be there. Share a beer with the movers and shakers in digital modes, get an education, and have a lot of fun. I absolutely guarantee that if you attend, you will leave ten times more excited about ham radio and digital modes than you've been in years. I look forward to seeing each and every one of you there this year. Until then . . .

73, Don, N2IRZ

ARRL & TAPR Digital Communications Conference

The 22nd Annual ARRL and TAPR Digital Communications Conference will be held September 19–21 in Hartford, Connecticut, just around the corner from ARRL HQ.

Once again hams from around the world will converge on this premier technical conference of the year. The DCC is an international forum for radio amateurs to meet, publish their work, and present new ideas and techniques. Presenters and attendees alike will have the opportunity to exchange ideas and learn about recent hardware and software advances, theories, experimental results and practical applications. For more information, visit <http://www.tapr.org>.

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beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

R-R-R: Tools You Really Must Have

Just like Tim Allen as Tim "The Tool Man" Taylor, I love going to the hardware store. It doesn't seem to matter where the store is, or what the store's name is. Sometimes I get the most interesting ideas just from looking at stuff on the shelves and racks and in the "Bargain Bin." Oddly, I was thinking of a business trip to the Seattle, Washington area several years ago. I don't remember the details of the trip, but I do recall that I found a really neat woodworking shop near the plant I visited. The store had some nifty "parachute bags" that were on sale. These canvas sacks have dividers and a cord going around the rim, and as you pick up the sack filled with stuff, the cord cinches the sack securely closed. I just had to have some, and ended up buying several, since they were on sale. . . .

As I browsed through the aisles at the hardware store this time, I came up with this soldering fume extractor (see photo 1). It could have been as simple as a fan mounted on a base, but I wanted to move the smells out through the window or door, rather than just spread the fumes back into the room. This isn't a new idea, but I found it an interesting exercise to see if I could find almost all of the parts for this project in one place.

The fume extractor is made from a junk-box 110 VAC muffin-type fan, a pair of L-brackets, a "fan-to-hose coupler" made from an outdoor drain cover, a 4 inch by 8 foot length of plastic clothes-dryer hose, a big hose clamp, a scrap-wood base, an AC line cord, and toggle switch. The plastic grille was cut from a bathroom fan cover, a leftover piece from a recent home-improvement project. Total cost—except for the fan, switch, and cord—was well under a "yuppie green stamp" ($20).

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Photo 1– The soldering-fume extractor. It's really just a fan on a stand.

Now that you have this workbench accessory, let's move on to see what else we need to build stuff. Take a look at photo 2 for an idea of what the essential tools for electronics work look like. You probably already have most of these items around your house somewhere.

Tools for your ham radio activities generally can be separated into two main categories: Building and Maintaining/Repairing. We discussed the art and skill of soldering in an earlier column (see "Beginner's Corner," May 2003 *CQ*, page 68). Hopefully, by now you have acquired the soldering skill and are ready to get going.

My tool collection has been growing continuously for well over 20 years, so don't feel that you need everything I mention here. The best way to build your tool collection is to get a tool when you need it to complete a particular task for a project. This way you won't break your budget excessively, and you won't get too many tools you may never use. Also (this is the best part), you can tell your spouse that you "really must have" this tool in order to complete the project you are working on. This is even better than the "it was on sale" story.

Photo 2– The very basic electronics tool kit. This is just about all you need to build (or take apart) an electronic gadget.

Chassis and Cabinet Working

Homebrew projects include the need to machine some sort of chassis and cabinet to support and house your creation. This aspect requires some specialized and some common tools you may already have on-hand.

If you "do" other mechanical or machine work, such as woodworking or metalworking, or maintain your own car, these skills will directly translate into making chassis boxes and cabinets for your projects. One really handy tip I learned in woodworking that applies here is something Norm Abram of the PBS shows "The New Yankee Workshop" and "This Old House" always says: "Measure twice; cut once."

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Photo 3– A laminate trimmer can be useful for cutting very clean cuts in plastics and other non-metal materials. Here I am making a cut-out in a Masonite front panel.

Photo 4– The Vix bit, used to drill perfectly centered holed for hinges, has a new application for electronics construction.

Now this is interesting, because I went to a beginner's woodworking seminar years ago and learned a really neat lesson. The instructor asked the class if anyone had a problem with measuring something, measuring again, and then making a cut. How many times did you miss the fit "by just this much"? Everyone raised their hand. The instructor told us a secret that I use almost every time I build something. It goes like this: "You won't make a measuring mistake if you don't measure."

What?

I'll say it another way: "If you don't measure, you won't make a measuring mistake."

Here's an example that may clarify things a bit. Say that you want to fit a piece of molding to a cabinet to dress up the top edge. Instead of measuring the space, you take your piece of stock, place one end against the far edge, hold the stock to the opposite end, and mark the piece against where it should fit.

Make the cut, making sure that the cut goes on the outside of your mark. This will ensure a tight-fitting joint. No need for filler or putty.

I use the same techniques in laying out chassis boxes and panels, and it works every time. Therefore, for electronics projects it's best to take your part, such as a volume-control pot, hold it in place against the chassis or panel, and center-punch for the hole.

The Dremel Moto-Tool is another gadget that I always wanted, but never got until a recent project "made me" get it. Since then I reach for the tool all the time. I often use it to grind and shape odd- or large-size holes and cut-outs in metal chassis boxes and for other metal- and plastic-working functions. In short, any time I would have reached for a file or a reamer, I now reach for the Moto-Tool. It's a lot faster.

Here is a safety tip for new motor-tool users: Wear gloves and an apron, as well as goggles and hearing protection. I learned this lesson the hard way, after grinding some holes in an aluminum chassis box. As I ground the odd-shaped holes, my left hand and arm began to get really itchy. Then I understood what was happening: Little shards of aluminum were flying out of the chassis box and into my skin. It was very much like getting little bee stings, with little aluminum stingers. After several minutes with a pair of tweezers and a strong light, I got most of the aluminum out of my skin. Now I avoid this hazard by wearing gloves. You should, too.

Another useful tool, similar to the Dremel Moto-Tool, is a small router or laminate trimmer (see photo 3). This tool is very useful for making accurate cuts in plastics and wood or wood materials,such as circuit-board material, or Masonite. Ask a friend who's into woodworking about routers and their uses. As an alternative, you can check woodworking magazines such as *ShopNotes* (go to <http://www.shopnotes.com>) and *Woodsmith* (see <http://www.woodsmith.com>

A drill press is a must. Again, I use it a lot in woodworking, so the cost is easily justified. Using a drill press instead of the "hand-held eggbeater" makes for cleaner and more accurate holes. Don't forget to center-punch where you want your hole, even with a drill press. Drill a small (i.e., 1/16 inch) hole first, then move up in diameter to final size.

As an alternative, you can use a drill motor mounted in a drill press "converter" such as the unit sold at Sears and other stores that sell tools.

Speaking of drilling holes, have you

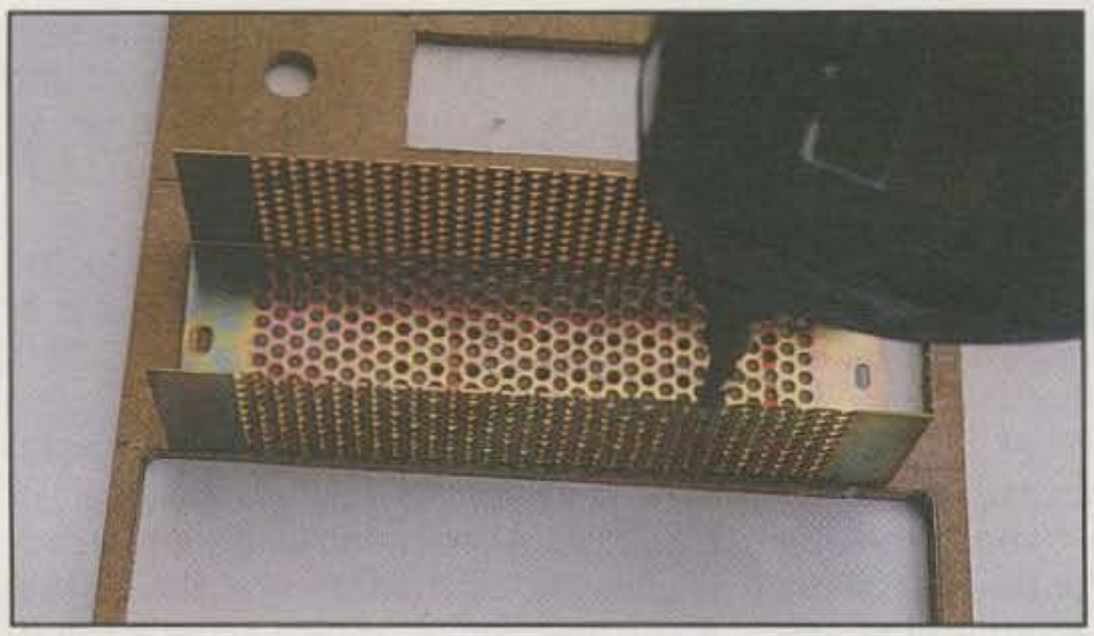

Photo 5– I needed to make several rows of holes in a panel to make a speaker grill in my "luggie talkie" project. The trick is to use a Vix bit and a hole-pattern template, in this case, the top cover/shield from a dry dummy load. If you want to get fancy, you can use a sheet of cane or perforated metal. However, this material is getting harder and harder to find.

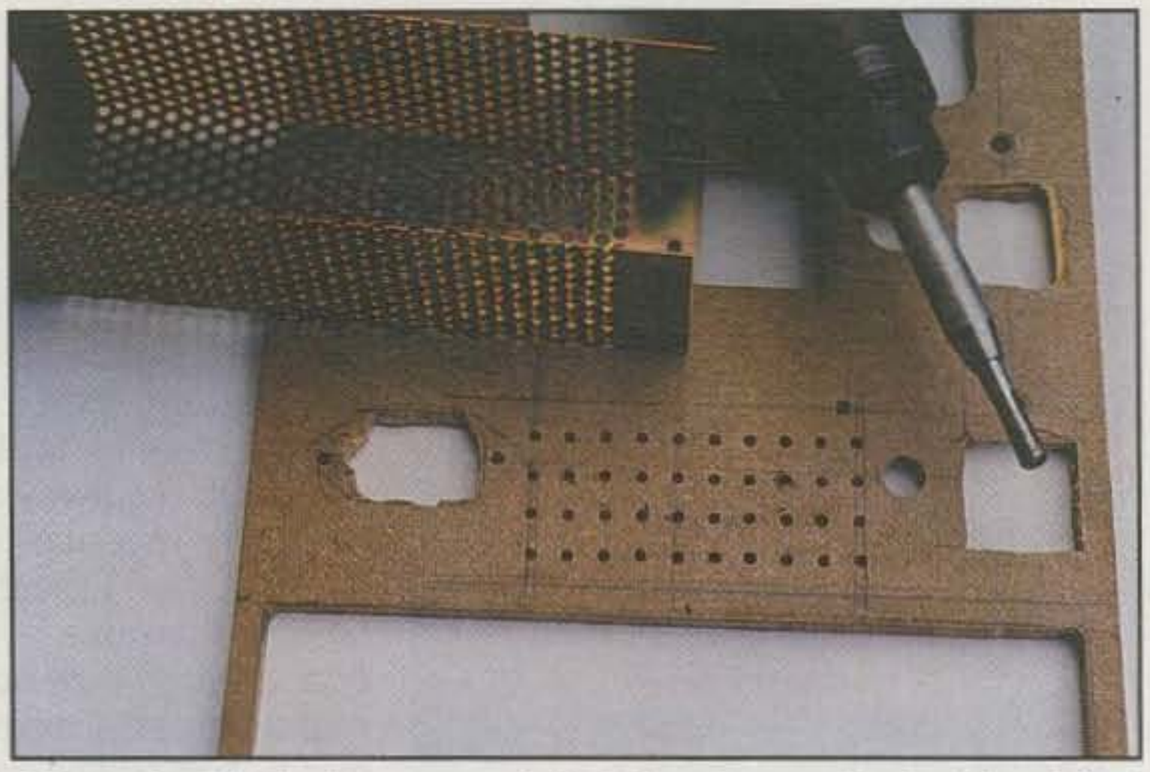

Photo 6– The hole pattern is held in place with double-sided (carpet) tape. The Vix bit centers into the pattern and drills holes that exactly match the pattern.

ever wondered how you could make ventilation holes as good as those in commercial gear? My technique was developed from a woodworking tip, which makes use of a special drill bit made for drilling dead-on-accurate mounting holes for hinges. It's called the Vix-bit, available from woodworking stores and mail-order houses. The secret of this bit is the centering device (see photo 4). The Vix bit is based on a twist drill, so it can be used for wood, metal, and plastics.

Photos 5 and 6 show the technique. The trick is to use a template, in this case the top cover/shield from my dry dummy load. If you want to get fancy, you can use a sheet of cane or perforated metal. However, this material is getting harder and harder to find. "Borrowing" a hole pattern from a piece of equipment works well.

You must use any power tool with care, though. Since it removes material faster, it makes the work go faster. However, by the same token, it will enable you to make mistakes much faster than ever before, too. Speaking of making mistakes, if you do drill a hole in the wrong place, you can patch the error with epoxy or a similar metal-compatible cement. Simply cover the hole on one side with strong duct or masking tape, mix some adhesive, and fill the hole. After the cement sets, you can sand the glue-blob flush and smooth. It's just like patching a small hole in your vehicle with auto-body filler.

A set of hollow-shaft nut-drivers will also make your life easier. You can chew up hex nuts pretty well with a pair of pliers or other non-proper tools. Oddly, after a few minutes of searching the internet, I couldn't find a table showing what size nut-driver fits what size nut. Thus, Table I shows what size nut-driver you need for what size machine hardware used in electronics.

The Innards: Wiring and PC Board-Stuffing

The "solder-sucker" really does a great job when it comes to de-soldering connections. When I used the "Solda-Pullit" for the first time, I was totally amazed at how well it works (see photo 7). I have used the dangerous "heat and blow" technique for years, but no longer recommend it. Of course, if you have the funds to do so, get one of those combination soldering and vacuum-de-soldering stations. They run about $1200 to $1500, and you probably won't use it all the time, unless you want to start a repair business of some kind.

If you do any work with dual in-line package (DIP) ICs, you will need a "chip-puller" and a chip-insertion tool. The puller looks like a large pair of tweezers, or maybe a small pair of tongs. If you attempt to remove a DIP IC from a socket with your fingers, you will end up with the IC stuck in your finger, which is very painful, something like getting your finger poked by a porcupine. The insertion tool works with a plunger-type action and squeezes the leads to proper spacing for the socket or the PC board. This is another tool that is getting more difficult to find. I was looking for another one at a recent visit to my favorite parts store, but the salesman said that the 14-, 16-, and 18-pin insertion tool has been discontinued. I have not seen a good substitute, so if anyone has any advice, let me know.

A good set of jewelers' screwdrivers is also a must. I have a set of No. 000 and 00 Philips and very small slotted sizes. They also are excellent for fixing eyeglasses.

As I get older, I am beginning to notice that my "close focus range" is getting weak. I mentioned this to my optometrist at my last check-up, but he said that it's not quite time for the bi-focals yet. (I am near-sighted.) The good news is that my vision has not changed in over ten years. When I asked my eye doctor

Machine Nut Size	Nut-Driver Size	Notes
2-56	3/16	Useful for replacing setscrews in knobs, other tiny applications.
4-40, 6-32	1/4	4-40 and 6-32 are probably the most popular fasteners for electronics use.
6-32 nylon insert locknuts	11/32	11/32 in. driver also good for chassis-mount RCA jacks.
10-24	3/8	3/8 in. driver also good for binding posts. 10-24 hardware is useful for heavy items, such as transformers and heatsinks.
1/4-20	7/16	Useful to start U-bolts used for small- to medium-size antennas. Use a wrench for final tightening.
—	1/2	The 1/2 in. nut-driver is a must for most potentiometers and wafer switches.

Table I– The size nut-driver to drive the particular size machine nut.

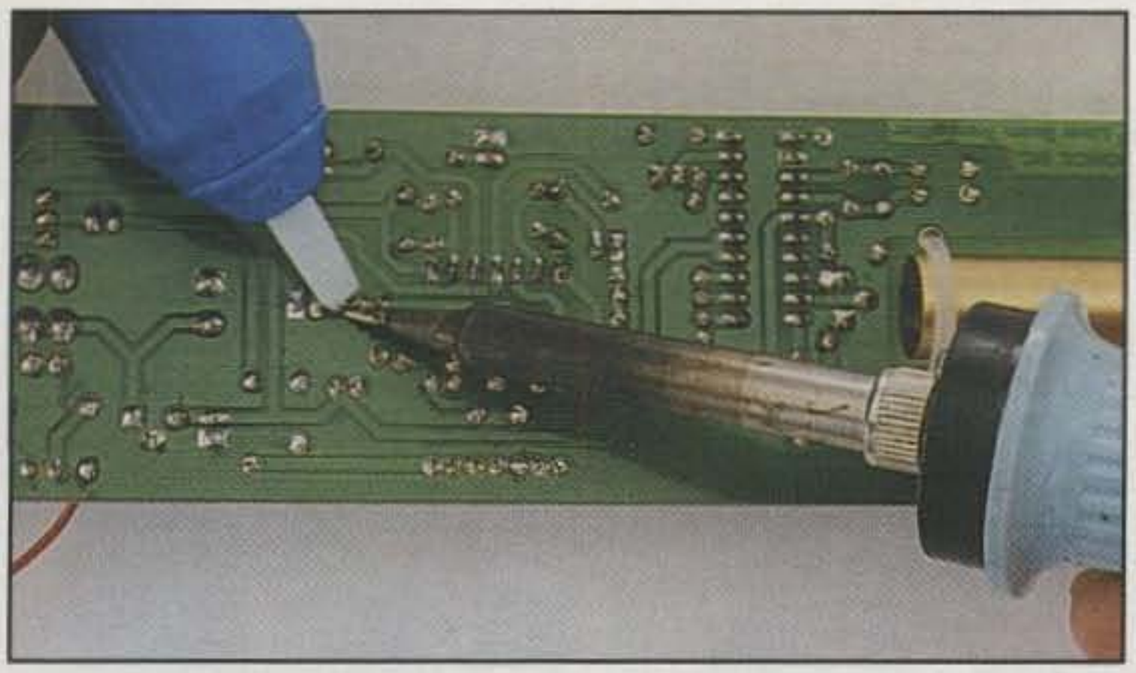

Photo 7– All done, and it looks pretty good, eh?

if he could sell me a good magnifier or set of eye loupes, he told me that there are much cheaper solutions for getting "up close." The solution is cheap and simple, which is what I like. He suggested that I simply take off my glasses and get closer to the work. What a neat solution, eh?

A heat gun is the only way to go when trying to shrink your heat-shrink tubing. I tried all the usual alternatives, including matches, cigarette lighters, hair dryers, and the end of a soldering iron, but nothing beats the heat gun. I bought it when I needed to remove some floor tile in my bathroom improvement project.

Do you have a favorite or unusual tool for electronics projects? If so, send me a picture of it and a brief description of what it is and what it does. I'll share the best ones in an upcoming column. 73, Wayne, KH6WZ

Feedback on Coax Connectors and Related Matters

Here are some comments on PL-259 assembly and related matters that you may find interesting.

Charlie Stokes, WB4PVT: "I was reading your [Peter O'Dell, WB2D's] article about coax connector maintenance in November, 2002 *CQ*. I have been using "Bucky-Seal" for some time now and find it to be the best on the market. I first use electrical tape, sticky side up, then cover the tape plus about an inch on both sides of the connector with Bucky-Seal. If I have to open the connector, all I do is cut the seal and tape, and with the non-sticky side down the connector can be open and worked on with very little effort. I also only use 88 tape, and a good coax seal. Bucky-Seal is only $5 a roll. For more information, go to <http://hamcall.net/buckyseal.html>

Bob Preston, W7TSQ, referred to the same article, and mentioned that the application of tape *prior* to applying the sealant makes it much easier to open the connector if needed. Also, Bob says that he always adds tape again on the outside.

Peter Chadwick, G3RZP, from the UK writes: I liked your article in May *CQ* on assembling PL-259s. First time I've seen the use of a tubing cutter advocated, although I've been using one for doing 259s that way for years. A couple of tips you might like to pass on:

Getting the body of the plug hot enough to really take solder can be a problem with a small iron. The hot-air paint-stripping gun from the DIY store does the job excellently, and does it fast enough to avoid melting the cable, too.

If the connectors aren't silver plated, a run around the holes for the braid with a needle file (Swiss file) to get the plating off and down to the brass is in order.

Ken Slusher, N2DF, agrees with the need to file off the chrome plating, and adds that he has been using a jewelers' saw to cut through the tinned braid. Ken also cautions against using crimp-on, CB-type connectors.

In fact, when I was writing this item, I never even thought about mentioning the crimp-on connectors. A long time ago I read an article someplace that talked about installing a mobile radio, and the mobile antennas at the time came with RG-58 and crimp-on PL-259s. (This is before RG-8X became available to hams, so we're talking a long time ago.) The article said to "take the crimp-on connector and throw it as far away as you can." That was so funny. I still remember it. *– KH6WZ*

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dx

BY CARL SMITH,* N4AA

Dayton Wrap-Up; Upcoming DX

Well, the Dayton hamvention® has come and gone—again. Those who were there know how it was, but for those who were not, it rained on Saturday, it was cool most of the time, and attendance was down about 10%. Even with those factors, 22,000 folks made it to central Ohio and overall I think it was good. There were new products to see, as usual *(see "Hot Stuff at Hamvention® 2003" elsewhere in this issue—ed.).* Most notable was ICOM's newest entry into the ham market, the IC-7800, a full-color, 200 watt HF + 6 meter transceiver. Every time I made it over to that part of the arena the crowd was very thick. The ICOM folks spent three days telling visitors to the booth about all the features to be expected.

A couple of new books were available for the first time at the Idiom Press booth. Bob Locher, W9KNI, introduced his third edition of *The Complete DXer.* If you have been reading this column for any length of time, you know I have mentioned the earlier editions of this excellent book. Bob has completely updated it and offers most of the little secrets that you need to know to effectively work DX. He gets into the use of packet clusters and also QRPing. A lot DXers who have reached the 300-plus countries level are looking for new challenges, and I know many who have taken up DXing using QRP. They have done some amazing things. Then, too, we have had pretty decent propagation for the last couple of years, and that has helped them. As we start dipping into the lower levels of the 11-year cycle, the challenge of QRPing on the lower bands could get very interesting. Bob's book gives you the story of how, when, and where to turn to keep DXing fun. I've only read part of it so far, but I am impressed with what Bob has done to update the book for today's DXer. I heartily recommend you get a copy.

Another book, also published by Idiom Press, is *Up Two,* written by Roger Western, G3SXW, from a DXpeditioner's perspective. If you haven't worked him in one of the 22 countries from which he has operated over the past 35 years, you probably don't work CW. Roger has been all over the world operating from some exotic places, and he tells about adventures dating back to 1970, when he operated from Afghanistan. His latest operation was from Burkina Faso in 2002. In between those two expeditions, he was active from places such as Macau, Nepal, Togo, Chatham Island, Cocos Keeling, Mayotte, and Tristan da Cunha. Roger includes chapters on pile-up operating and QSLing, both subjects of interest to DXers trying to work DXpeditions. I have not had time to read Roger's book in depth, but from a cursory look, I don't believe you could go wrong by investing in a copy for your bookshelf. Both *The Complete DXer* and *Up Two* are available from Idiom Press, P.O. Box 1025, Geyserville, CA 95441 (on the web: <www.idiompress.com>).

This photo was taken at the Seoul restaurant in Ulaanbaatar during a celebration to present Chak, JT1CO, with his 5B WAZ award. Left to right: the older JT ham, homebrew-transceiver maker N. Sank, JT1AS; retired Colonel H. Tuul, JT1AJ (former chief op at JT1KAA); and Chak, JT1CO. (Photo courtesy Ken, K4ZW)

Dayton's DX Forum brought forth a name from the past—Don Miller. Don was a DXpeditioner back in the 1960s and had quite a reputation in those days for his operating expertise. His DXing days ended when he got into trouble for claiming to be operating from locations where it was proven that he was *not* really there. There were other factors, too, which resulted in him spending many years off the air, but I won't go into them here. If you are interested in what he had to say at the DX Forum, the transcripts are available by e-mail from Richard Boyd, KE3Q. Send $2 and your e-mail address to Rich Boyd, 18601 Queen Anne Bridge Road, Mitchellville, MD 20716. Also available for $2 are the remarks of Wayne Mills, N7NG, of the ARRL, on Logbook of the World.

Speaking of the Logbook of the World, the testing continues. Tens of thousands of QSOs have been uploaded to the Logbook, and ARRL personnel are handling suggestions/comments as the system is run through its paces to determine if it will accomplish its intended purpose. From the comments I've seen/heard, it would seem that we are headed in the right direction. Eventually, assuming we can get DXpeditioners to put their logs into that system, we will have resolved one of the biggest gripes we have about getting QSL cards. No longer will we have to beg, plead, and anguish

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3112	KG6DFM	3114	RU3DX
3113	KØCF		

SSB

2864	W4OFE	2866	KØCF
2865	W2OO	2867	RU3DX

Mixed

1918	W2OO	1920	N5DD
1919	KØCF	1921	RU3DX

CW: 350 KØCF. 400 YU1PC. 600 OM7CA. 700 RU3DX. 750 JA3WFQ. 1300 WA3GNW. 1600 EA6AA. 3900 N4NO.

SSB: 350 KG6DFM. 500 W4OFE, K2PH. 550 IZØBNR, W2OO, KØCF. 600 7N1NXF, JK7QJK. 950 G3TSZ. 1000 NØYO. 1250 WA3GNW. 1350 RU3DX. 3300 N4NO.

MIXED: 700 W2OO, KØCF. 750 JA3WFQ. 850 N5DD. 1550 RU3DX. 1950 WA3GNW. 2550 ON4CAS. 3800 WB2YQH. 4400 N4NO.

10 Meters: N5DD, RU3DX
15 Meters: NØYO, N5DD, RU3DX
20 Meters: N5DD, RU3DX
40 Meters: RU3DX
80 Meters: RU3DXA
160 Meters: EA5YU, RU3DX

Asia: OM7CA, KG6DFM, N5DD, RU3DX
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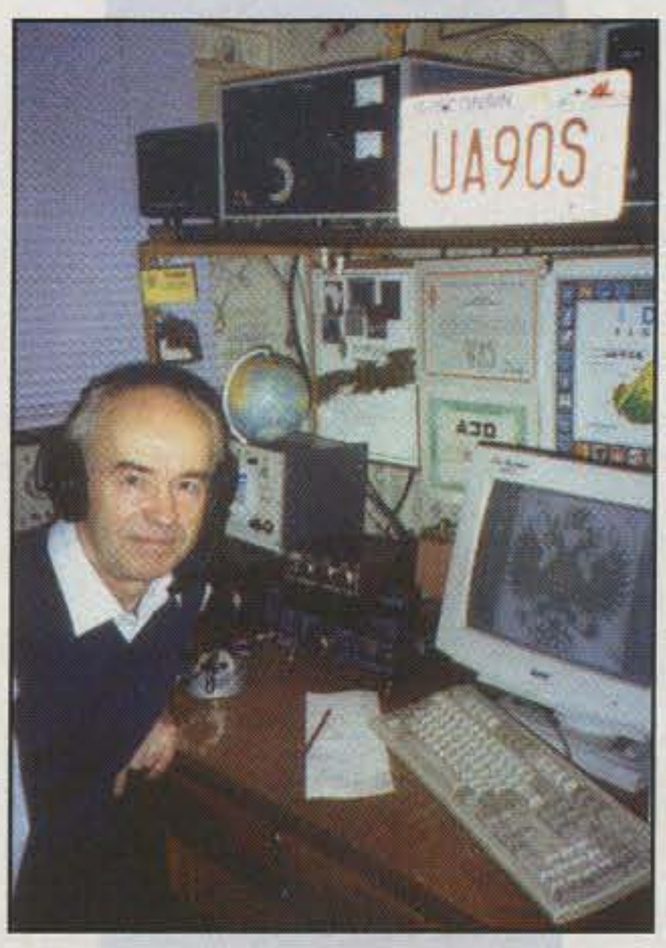
Oceania: ON4CAS, N5DD, RU3DX

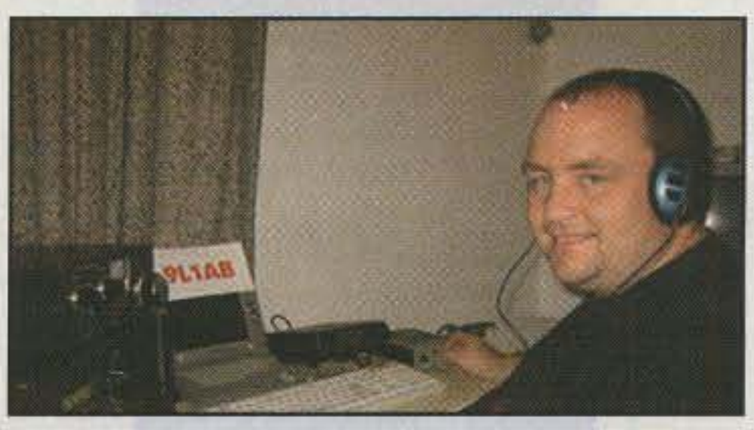
Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, W0ULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4GP, K4LQ, KØKG, DL6ATM, VE9FX.

160 Meter Endorsement: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP, DL6ATM.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. ***NOTE:*** *WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*



Victor Pisanov, UA9OS, at his station in Novosibirsk, Asiatic Russia, using a TS-450S and homemade solid-state PA. He has worked 323 countries and recently received the 5B DXCC Award. (Photo courtesy W8PHZ)



Andy, G3AB/9L1AB, was active last November from Sierra Leone. He obviously enjoys himself on these DX-peditions. (Photo courtesy Andy, G3AB)

A group of DXers gathered to meet with John, ON4UN, at Ten-Tec in early June. Left to right, standing: Larry, W6UB; Pat, W4PV; Doyle, N4VV; Lynn, W4NL; Don, W4TO; and Steve, K8EJ. Seated are Scott, W4PA, and John, ON4UN. (Photo courtesy Lynn, W4NL)

over when we will get the card. DXCC credit will be accepted by using the Logbook of the World, whether we actually have a card in our hands or not. While we all want that "hard copy" for our walls, record books, etc., at least we can have credit for our contacts while we wait for the actual card(s) to come through the mail. I personally look forward to the full implementation of this much-anticipated technology.

A Visit with ON4UN

I had the opportunity to make a short journey in early June to meet John, ON4UN. He spent three weeks traveling around the U.S. visiting with the "big guns" of the low bands and looking over their antenna systems, equipment, etc. The purpose of this trip was to acquire more background for the revision of his very popular book, *Antennas and Techniques for Low Band DXing.* A group of us met John at the east

Tennessee facility of Ten-Tec, where John was looking over the new ORION radio (see photo). We had a good time chatting with John about various topics and then had a tour of the Ten-Tec plant, conducted by Scott Robbins, W4PA.

Upcoming DX

Well, yes there are a number of operations scheduled for this summer and early fall.

CY9 – St. Paul Island will be active from late July until early August.

FP – St. Pierre & Miquelon likewise will be on the air the end of July to early August.

3DA – Swaziland will be activated by two ops after their operation from Lesotho the end of July.

5W – Samoa will be available August 4–14.

XU – Cambodia is scheduled for August 4–18.

FH – Mayotte will be coming up September 16–23.

VK9X – Christmas Island will be on the air October 26 to November 9.

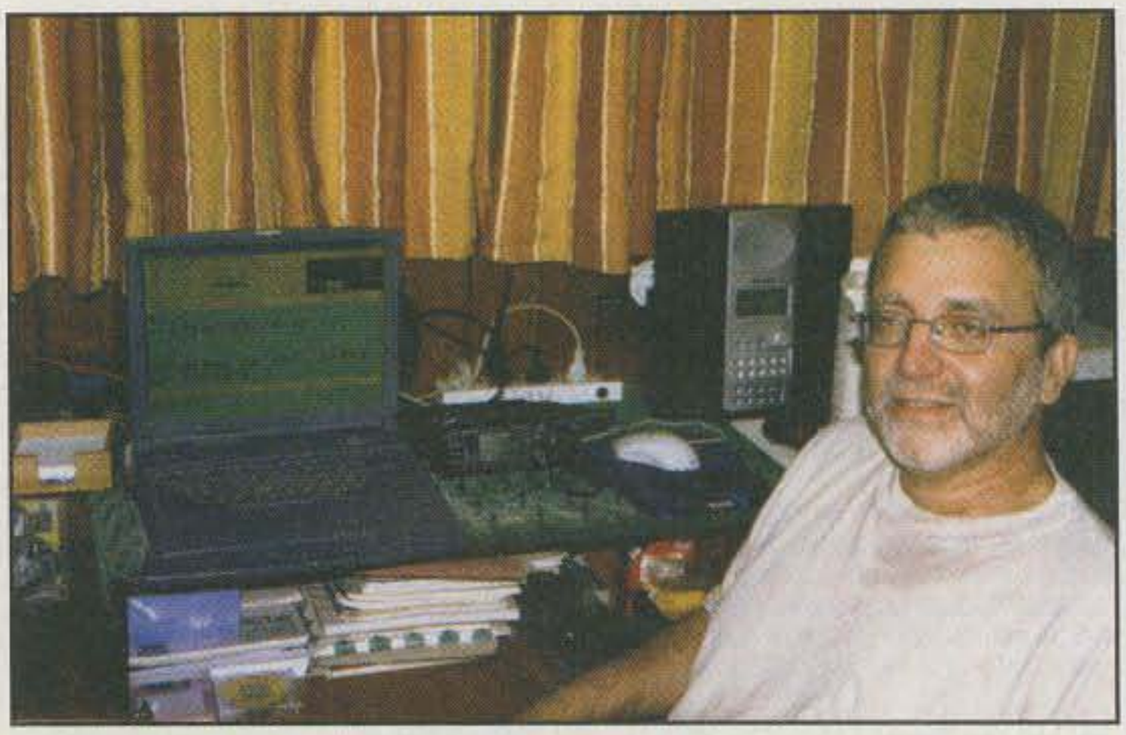
T33 – Banaba is being scheduled for the March/April 2004 time period. Banaba is one of those most needed, especially in Europe and also on the low bands, so this one should generate a lot of activity.

W9-DXCC Convention

I have to mention the W9-DXCC Convention scheduled for September 20 in Chicago. I definitely will be there again this year hosting the Friday Welcome Reception. I look forward to seeing all of those "big gun" W9's and WØ's on the weekend. As I recall, last year at the DXCC countdown the last man standing claimed an astronomical 386 confirmed! It's always a good crowd and a very good program. More details and a registration form are available at: <www.w9dxcc.com>.

Free-Banding Revisited

I'm going to mention Free-Banding once more. Without absolute verification I will not give specific names/calls, but I will say that two Pacific operations earlier this year were reportedly operating both amateur and Free-Band while on the air during the same time frame. Legal? Illegal? I am not in a position to judge that, but I will say, as I have before, that *if* these parties used amateur radio as a "foot in the door" to gain permission to operate and then operated on the so-called Free-Band frequencies, they should at least be chastised for their actions. Amateur radio



Dov, 4Z4DX, at his 9N7DX operating position in Kathmandu last February. Dov and his son Mat, 4Z5DX, managed about 8000 QSOs during their stay. They also spent a few days hiking in the mountains. (Photo courtesy Dov, 4Z4DX)

The WAZ Program

10 Meter SSB

553 .....EA8LS 554 .....WA5IPS

15 Meter SSB

598 .....JA1ESH

20 Meter SSB

1112 .....IK8TMI 1113 .....W9OP

80 Meter SSB

79 .....EA4KD

10 Meter CW

182 .....WB9CIF

12 Meter CW

39 .....JG3LGD 40 .....N4NX

15 Meter CW

310 .....I5KHX 311 .....7K3QPL

17 Meter CW

50 .....N4NX

40 Meter CW

234 .....N4NX

20 Meter RTTY

53 .....4Z5AV

6 Meters

60 .....W9JUV (27 zones)

160 Meters

109 .....DL3JJ (endorsement 39 zones)

All Band WAZ

SSB

4866 .....JA9GLW 4869 .....KH6ALF
4867 .....KC5KJE 4870 .....EA1DDO
4868 .....JI3KGW 4871 .....T93Y

Mixed

8234 .....WØRC 8239 .....7J1ABD
8235 .....JA6CBW 8240 .....VE3CFK
8236 .....KA2NDX 8241 .....W3RFQ
8237 .....JA1BZM 8242 .....T93Y
8238 .....JA6ARJ

All CW

367 .....7K3QPL 370 .....OK2PKY
368 .....RA1AOB 371 .....JA9GLW
369 .....JA3UNA 372 .....T93Y

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

5 Band WAZ

As of June 15, 2003, 624 stations have attained the 200 zone level and 1332 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:

NW4N IK4WMA

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
KL7Y, 199 (34)
NN7X, 199 (34)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
KC7V, 199 (34)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
HB9BGV, 199 (31)
N3UN, 199 (18)
OH2VZ, 199 (31)
K5MC, 199 (22)
W1JZ, 199 (24)
K2UU, 199 (26)
W1WAI, 199 (24)
W1FZ, 199 (26)
SM7BIP, 199 (31)
PY5EG, 199 (23)
SP5DVP, 199 (31 on 40)
KY7M, 199 (34)
W8AEF, 199 (40)
K8RR, 199 (26)
UU5JR, 199 (4)
W8GF, 199 (22)
N4NX, 199 (26)
OE2BZL, 199 (1)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
UA4PO, 198 (1, 2)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
KF2O, 198 (24, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
N4XR, 198 (22, 27)
N4PQX, 198 (24, 26)
RU3DX, 198 (1, 6)
UT5JAJ, 198 (12, 30)
N8PR, 198 (18, 24)
N6HR/7, 198 (34, 37)
N4MM, 198 (24, 26)

The following have qualified for the basic 5 Band WAZ Award:

Endorsements:

N4NX (199 zones)
WA5IPS (185 zones)
N6OU (182 zones)
OE2BZL (199 zones)
SM4AZQ (200 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Paul Blumhardt, K5RT, 2805 Toler Road, Rowlett, TX 75089. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Paul Blumhardt. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. K5RT may also be reached via e-mail: <k5rt@cq-amateur-radio.com>.

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive.

MIXED

5167 9A2AA	3823 VE3XN	3233 WB2YQH	2952 W2WC	2436 W7OM	2212 PY2DBU	1949 VE6BF	1561 N1KC	1163 K6UXO
4590 W2FXA	3726 I2PJA	3239 KF2O	2944 IT9QDS	2421 W9OP	2203 W4UW	1837 AA1KS	1487 WT3W	1130 PY1NEW
4154 F2YT	3668 N4MM	3167 S53EO	2824 W2ME	2390 W8UMR	2126 WB3DNA	1772 VE9FX	1472 OK1DWC	865 N5DD
4146 W1CU	3633 YU1AB	3140 K9BG	2772 YU7GMN	2361 W6OUL	2018 HA9PP	1724 W7CB	1448 NG9L	803 VE3NQK
4098 EA2IA	3548 N9AF	3121 PAØSNG	2655 WA1JMP	2340 K5UR	1999 I2EAY	1705 KØKG	1421 KX1A	742 K5IC
4014 9A2NA	3489 SM3EVR	3088 KØDEQ	2585 9A4W	2304 OZ1ACB	1976 DJ1YH	1697 Z35M	1369 KW5USA	699 W2OO
3999 N4NO	3465 N5JR	3008 IK2ILH	2545 W9IL	2226 JN3SAC	1958 CT1EEB	1587 W2EZ	1226 EA2BNU	697 KL7FAP
3833 N6JV	3289 I2MQP	3005 HAØIT	2454 K2XF					

SSB

4446 IØZV	3165 EA2IA	2734 4X6DK	2337 W2WC	1978 N6FX	1839 I3ZSX	1555 W2FKF	1218 WT3W	990 HA9PP
4050 ZL3NS	3121 N4NO	2719 KF2O	2325 CX6BZ	1969 CT1EEB	1736 K3IXD	1538 VE9FX	1194 N1KC	959 VE7SMP
4018 VE1YX	3117 I2MQP	2594 I8KCI	2301 HAØIT	1954 CT1EEN	1721 DK5WQ	1533 KI7AO	1193 I2EAY	903 N9DI
3705 I2PJA	3049 F2VX	2570 LU8ESU	2270 IN3QCI	1937 I8LEL	1704 IT9SVJ	1520 DF7HX	1190 K4CN	844 KX1A
3649 F6DZU	2960 I4CSP	2509 EA5AT	2259 K5RPC	1903 NQ3A	1685 W6OUL	1384 LU3HBO	1162 EA5DCL	822 K1BYE
3260 CT4NH	2938 CT1AHU	2487 KF7RU	2002 LU5DV	1864 K2XF	1606 K8MDU	1368 NG9L	1078 EA3KB	812 KU6J
3243 OZ5EV	2885 N5JR	2455 EA1JG	1994 W4UW	1862 EA7TV	1562 W2ME	1254 JN3SAC	1062 AG4W	776 YBØAI
3234 N4MM	2741 PAØSNG	2388 OE2EGL	1988 K5UR	1852 W7OM	1562 SV3AQR	1238 LU4DA	1048 EA3EQT	702 KU4BP
3211 9A2NA								

CW

4273 WA2HZR	2822 LZ1XL	2325 KF2O	2102 N6FX	1898 K5UR	1728 W9IL	1483 EA6AA	1146 K6UXO	898 WT3W
3834 N6JV	2583 W2ME	2315 KA7T	2009 OZ5UR	1847 IK3GER	1679 EA8AAW	1342 WO3Z	1118 EA2BNU	830 N1KC
3558 N4NO	2578 N5JR	2312 JA9CWJ	1955 G4SSH	1846 KS4S	1671 DJ1YH	1332 EA2CIN	1118 HB9DOT	809 KU6J
3476 K9QVB	2558 N4MM	2301 EA7AZA	1938 LU2YA	1832 VE6BF	1668 I2EAY	1309 AC5K	1081 W4UW	767 VE9FX
3469 VE7CNE	2428 W2WC	2197 W8UMR	1919 K2XF	1803 W6OUL	1624 I2MQP	1282 DF6SW	1032 WA2VQV	710 KØCF
3178 EA2IA	2399 HAØIT	2147 I7PXV	1905 JN3SAC	1798 W7OM	1520 4X6DK	1158 YU1TR	953 KX1A	642 PP6CW
2831 9A2NA								

should not be used as a means to an end for operating Free-Band, and such activity should not be condoned by any organization.

I hope you all are enjoying the summer and getting those low-band antennas assembled in preparation for the fall/winter season. Until next time, enjoy the chase. 73, Carl, N4AA

CQ DX Awards Program

SSB

2406 N8LIQ
2407 K4IE
2408 WA3IOU

CW

1047 PP6CW
1048 HL3GOB

SSB Endorsements

320 K3LC/328
320 NI5D/327
300 K4IE/300
320 N8LIQ/284

CW Endorsements

320 W4UW/329

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 335 active countries. Please make all checks payable to the award manager.

QSL INFORMATION

1SØXV via N2OO
1S1RR via N2OO
3DAØSV via K4YL
3DAØWC via VA7DX
3V8SM via F8DVD
3V8SM via DL1BDF
3WØA via K2PF
3W100HCM via K2PF
3W7A via K2PF
3X1Z via K2PF
3XY5A via K4ZLE
3ZØIL via SP8ZBX
4A2Q via WD9EWK
4K7Z/F8LPX via F8LPX
4U/TF1MM via TF3MM
4W1BK via WA2MOE
4W1DN via JR2KDN
4W2DN via JR2KDN
4W3CW via G3WQU
4W3DX via TF3MM
4X/TF1MM via TF3MM
4X1UH via W3HNK
5B4/DF4ZK via DF4ZK
5H3RK via VK4VB
5H9KR via VU2RKS
5NØDOG via NZ9Z
5NØRMJ via K2PF
5N20DOG via NZ9Z
5N20RMJ via K2PF
5N4ROF via K1BV
5N6/KE6GEM via K4ZLE
5R8GZ via G3SWH
5T5ZZ via K1BV
5W/9A6XX via N1SNB
5W/9K2RR via N1SNB
5W/DL2AH via DL2AH
5W/K9YO via N1SNB
5W/MØGMT via N1SNB
5W/N1SNB via N1SNB
5WØAH via DL2AH
5WØDA via F6JOB
5WØGW via DL2AWG
5Z4/AA5ID via AA5ID
5Z4BI via NZ9Z
6Y5/K4ZLE via K4ZLE
7P8DA via K4YL
7P8IZ via W0IZ
7S6N via SM6CNN
7W4HI via OM3CGN
7X5ST via 7X2LS
8P1A via NT1N
8R1ZG via NZ9Z
9A/S57CQ/P via S57DX
9A/TF1MM via TF3MM
9A6MM via TF3MM
9H3/IK1PMR via IK1PMR
9H3A via OE8YDQ
9H3AA via OE8CIQ
9H3UT via DL9GDB
9L2SH via K4ZLE
9M2/G3TMA via G3TMA
9M2RY via N4JR
9M2TO via JAØDMV
9S3UT via DL9GDB
9X5AA via W9OL
9Y4BTG via 9Y4BTG
9Y4TBG via DL4MDO
A4XYS via W9OL
AA5ID/5Z4 via AA5ID
AH2AJ via WA3HUP
BS7H via KU9C
BV9AAC via BV2KI
BV9L via BV4YB
C53M via OH9MM
C56R via OH9MM
C6AKU via K9VV
C8A via ZS6MG
C91AA via WZ8P
CE9/R3CA via RW3GW
CN8CX via WA3HUP
CN8CY via WA3HUP
CN8FC via WA4QMQ
CQ2BY via WA3HUP
CQ2UW via WA3HUP
CQ4BY via WA3HUP
CQ5AA via CT1RVM
CQ5BY via WA3HUP
CQ6UW via WA3HUP
CQ7UW via WA3HUP
CQ8BY via WA3HUP
CR3KD via WA3HUP
CR4BY via WA3HUP
CR5XX via WA3HUP
CR6BY via WA3HUP
CR6GA via WA3HUP
CR6XX via WA3HUP
CR8BY via WA3HUP
CR9C via K4EU
CSØBY via WA3HUP
CS1BY via WA3HUP
CS2BY via WA3HUP
CS2UW via WA3HUP
CS7AL via CT1BXE
CT1BY via WA3HUP
CT3EE via CT3EE
CT4UW via WA3HUP
CU2/SM4DHF via SM4DHF
CU9B via WA3HUP
CX7BF via CX4AX
CY9A via N5VL
D2CR via RK3BR
DK/MUØBKA via K4ZLE
DS4DBG via DS4DBG

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," P.O. Box 3071, Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

BY JOHN DORR,* K1AR

Where Are Contest Rules Going?

August's Contest Tip

When we think of receiving antennas, we often consider beverages for 160 and 80 meters. As it turns out, beverages can be effective on all of the ham bands, not only for noise reduction, but in receiving signals when using Yagis and other directional transmitting arrays. Another trick along these lines is to use a vertical for alternative receiving on the high bands. There are often situations when someone is calling you "in the mud" only to be missed because the transmit antenna is pointing in the wrong direction. A quick switch to an alternative antenna, such as a vertical, often will result in your ability to copy the calling station, putting a new QSO or multiplier in the log. Try it!

The sport of contesting has continued to become more and more competitive in recent years. Not unlike the founding fathers of any sport, the originators of contesting had no idea to what extent contests would drive a "hobby" into a state of near professionalism in its extreme. Although some critics view this fanaticism to be detrimental to the hobby, contesting's "professionals" have contributed immeasurable benefits to a standard that most of us now take for granted.

As the years have passed, the rules have been updated to reflect our changing environment. I thought you might enjoy reading the original set of CQ WW rules as a tangible example of our roots (see sidebar). Clearly, these original rules and regulations have undergone substantial modifications since the very first CQ WW in 1948 (I'm particularly amused by the phrase "more-than-one-operator section"). Most of these changes have taken into consideration the need to employ a basic assumption: the belief that contest operators are essentially honest and can be trusted to submit entries that truly reflect the outcome of their efforts. Fortunately, the conclusions from man-years of log checking have proven this to be fundamentally true.

Nevertheless, there is one area with which contest administrators have struggled over the life of contesting. Where should the development process for contest rules draw the line in enforcing the gray areas of interpretation? Furthermore, how do we manage the incredible growth of technology and its use in contesting?

For the most part, contest rules are fairly explicit about the standards of measurement. For example, you will always find a definition of the operating classes, exchange, scoring guidelines, log deadlines, including acceptable/preferred methods of submission, and other black-and-white details. However, in recent years we've seen needed "feature creep" in the rules that address a myriad of specific issues. Here are a few examples:

• All high-power categories must not exceed 1500 watts total output power on any band (rule designed to create a cap on power levels that may legally exceed 1500 watts in certain countries).

• Self-spotting not allowed (exceeds spirit of contest where technology such as packet prevails over radio communications).

• Transmitters and receivers must be located within a 500 meter diameter circle (eliminates virtual stations spread across a city or even an entire country).

• All antennas must be physically connected by wires to the transmitters and receivers used by the entrant (eliminates remote station operation).

• Only one signal is allowed at one time on any band (prevents the unfair advantage that comes from using multiple transmitters on a single band to increase run rate).

• The use of DX alerting assistance of any kind places the station in the Single Operator Assisted

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Calendar of Events

July 26–27	Venezuela Independence Day CW Contest
Aug. 2	European HF Championship
Aug. 2–3	North American CW QSO Party
Aug. 9–10	Worked All Europe CW Contest
Aug. 9–10	Maryland QSO Party
Aug. 16	SARTG WW RTTY Contest
Aug. 16	RDA Contest
Aug. 16–17	North American SSB QSO Party
Aug. 16–17	New Jersey QSO Party
Aug. 23–24	Ohio QSO Party
Aug. 30–31	YO DX HF Contest
Aug. 30–31	SCC RTTY Championship
Sept. 6-7	All Asian SSB Contest
Sept. 7	North American CW Sprint
Sept. 10–12	YLRL Howdy Days
Sept. 14	North American SSB Sprint
Sept. 20–21	SAC CW Contest
Sept. 20–21	Washington State Salmon Run
Sept. 27–28	**CQ World-Wide RTTY Contest**
Sept. 27–28	SAC SSB Contest

Steve Miller, N8SM, SK

On Sunday, June 15th, Steve Miller, N8SM (ex-WD8IXE) suffered a fatal fall from his tower at his home in Dallas. Steve, who was 38, leaves behind a wonderful wife, Radhicar, and a daughter, Elise.

Steve became a radio amateur in 1977 at the age of 10. He was excelling in DXing and contesting at a point in his ham career when many of us were still trying to learn how to adjust a J-38. When the SouthWest Ohio DX Association was founded in 1981, WD8IXE was there. When Steve was 21, he made his first-ever flight with other SWODXA members on the inaugural J6DX expedition, finishing third in the world.

Steve became the antenna expert for the group, designing 40 meter vertical arrays for the team. When each new antenna was raised, he would tell us, "We're getting louder now!" We think the secret was in the special base insulators. He was the prime rate operator when J6DX won the world CQ WW Multi-Single title in 1993 and 1996. He made more than 800 contacts on 40 meters in the first four hours of the 1993 contest, and had a best rate of 236 Q's/hr. His 15 meter Multi-Multi record of nearly 4000 QSOs was set in 1991 and held for several years. He set that record using a 3-element Yagi on a 20 foot mast.

Steve graduated from Ohio State with a BS and then an MS degree in Electrical Engineering. He was employed as an Electrical Engineer at Texas Instruments. He was also an accomplished musician and loved playing the saxophone.

All of us who knew Steve will remember him and wonder why it was he who had to leave first. Rest well, Steve.

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1948 CQ World-Wide DX Contest Rules

(as printed in August 1948 CQ magazine)

1. Contest Period: 0200 GMT, October 30 to 0200 GMT, November 1 for Phone and 0200 GMT, November 6 to 0200 GMT, November 8 for CW.

2. Bands: The contest activity will be confined to four bands: 3.5, 7, 14, and 27–28 mc amateur bands.

3. Divisions and Sections: The competition will be divided into two divisions: CW and phone. Each of these two divisions will be divided into two sections: the one-operator and more-than-one-operator section. Thus, there will be: (1) one operator CW section, and (2) more-than-one-operator CW section; (3) one operator Phone section, and (4) more-than-one-operator Phone section. Stations in each section will compete for awards only with others in the same section. CW stations must work CW stations, and Phone stations must work Phone stations only; however, stations in the more-than-one-operator section of both Phone and CW divisions may contact each other. Stations may enter in more than one section but logs must be submitted for each section.

4. Equipment: There will be no limit to the number of transmitters and receivers allowed and competitors may use the maximum transmitter power permitted under the terms of their licenses.

5. Serial Numbers: CW stations will exchange serial numbers consisting of five numerals, the first three being the RST report, and the last two being their own zone number. Stations in Zones 1 through 9 will prefix their zone number with zero (01, 02, 03, etc.). Phone stations will exchange serial numbers consisting of four numerals. The first two being the readability and strength report and the last two being their own zone number. Phone stations in Zones 1 through 9 will prefix their zone number with zero (01, 02, 03, etc.).

6. Contacts: Contacts between amateur stations on different continents shall count three points; contacts between amateur stations on the same continent but not in the same country shall count one point; contacts between stations in the same country, for the purpose of obtaining zone and/or country multipliers, shall be permitted but no points will be allowed for these contacts.

7. Multipliers: Two types of multipliers will be used: (1) a multiplier of 1 for each zone contacted on each band, (2) a multiplier of one for each country worked on each band.

8. Scoring: The contest score will be the sum of all contact points multiplied by the sum of the zones and country multipliers.

9. Awards: Certificates will be awarded to sections winners in each division of:

1) Each USA call area
2) Each licensing area of Canada and Australia
3) All other countries

Certificates will also be awarded to each operator of each winning station in the more-than-one-operator section.

10. Zones and Continents: The WAZ boundaries as defined in "CQ DX" and in *CQ*, January 1947, and the recognized continental boundaries as used for WAC will determine zone and continents boundaries. The WAZ maps are reasonably accurate, but should any question arise as to the positive location of a station, the official definitions will be final. The latest official country list as published in *CQ* for May 1948, with any revisions announced since then, will be used to determine country multipliers. Copies of the country list are also available from the *CQ* Editorial Office upon receipt of a self-addressed envelope.

11. Eligibility: The contest is open to all amateurs but *CQ* staff members are not eligible for awards.

12. Disqualifications: Falsification of logs or illegal operation in any manner will be cause for disqualification. The decision of the judges will be final in all cases.

category (there are an unfortunate number of stations that need to study this rule in particular, as is pointed out in this month's 2002 CQ WW SSB Contest results).

The bottom line of this discussion is simple. Do I think that crossing the unwritten ethical line is a problem for contesting today? The answer is NO! Do I think it is a subject that needs regular review with meaningful checks and balances? Absolutely YES! That, in part, is why contest rules are reviewed and changed on a regular basis to adapt to the times. We can never legislate our way into honesty. However, fortunately for contesting, the reason our sport fundamentally works is that we are inherently honorable in our endeavor. No set of contest rules will ever offer a solution if that basic ethical position changes, nor will we be able to completely equalize our varied circumstances of age, location, station, etc. Through all of this, the thing to remember is to have fun at what you do. When we stop having fun as contesters, there's little other reason to keep participating!

Final Comments

On the lighter side, I already know what a few of you are thinking. Yes, the 1948 certificates have been mailed, and no, there were no Cabrillo issues in 1948. In fact, references to Cabrillo during 1948 seemed to be limited to the recreation of the Italian-Spaniard W. Tognazzini-Cabrillo's landing at Morro Bay. Further details about Morro Bay's IOTA number and DXCC entity candidacy were not available at press time.

Unless you've been hiding in a hole, you know that we are in the throws of summer and many antenna projects are well under way (at least we're finally beginning to think about them). Don't let the solar conditions deter you. Rather, use them as an excuse to put up a bigger and more interesting set of antennas in your backyard!

73, John, K1AR

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BY JOE LYNCH,* N6CL

Record-Setting Sporadic-*E* on 222 MHz

June 16, 2003 (June 17 UTC) proved to be a bell-ringer day for ops between Arizona and western Washington State. While not record setting in distance, it was indeed a record-setting time of extended 222 MHz propagation. Here are some of the reports:

From **Ned Stearns, AA7A:**

June 17 was one of the most amazing evenings of radio for me. Six meters opened up at around 0200 UTC in a normal summer-evening fashion. The MUF *(maximum usable frequency—ed.)* was building steadily until around 0230 UTC, when I started to hear weak signals on 144.200. I fired up the 2 meter amp and called a quick CQ and worked K7IEY in CN87 at 0240 UTC. The band quickly settled into a very good opening where there were many 40 over S-9 signals on the band. I managed to log 20 stations in the WA/BC area for the next half hour as I have done in openings such as this over the past 25 years from Phoenix. However, this year I had done something different.

I had recently completed my 222 MHz station in preparation for this year's ARRL June VHF QSO Party. I am now using a Yaesu FT-736R with the 220 MHz module, a Mirage 120 watt brick, and an M^2 8 WL Yagi at 25 feet. On a lark, I swung the antenna up towards the Pacific Northwest as the opening kicked into really high gear. I was alternating working stations on 2 meters and calling CQ on CW on 222.1 MHz. I would announce when I went to 222 MHz on the 2 meter frequency and there would be a bunch of ops who would acknowledge on the 2 meter frequency that they would listen on 222 MHz.

I must say that hearing K7NQ's call pop out of the noise gave me a shock. He faded out before he was done calling me. I called him for a while longer but he didn't come back. I went back to 2 meters to inform him that I had heard him. Then we went back to 222 MHz. After a few minutes he reappeared and we quickly completed at 0311 UTC. I was simply amazed. I've been around enough to know that was a real accomplishment.

I heard nothing else on 222 MHz after I continued calling, so I went back to 2 meters and worked nine more stations in the PNW. I would go back to 222 MHz every couple of minutes and call CQ on CW. About 20 minutes after my first 222 MHz sporadic-*E* contact, signals picked up a lot on 2 meters and I went back to calling diligently on 222 MHz. I then worked two more stations on 222 MHz: K7ND and W7YOZ at around 0340 UTC. When that peak of the opening was over, I caught them back on 2 meters and they were as ecstatic as I was about these contacts.

Word apparently got out and I had quite a gang hanging around my 2 meter run frequency as I continued to work stations that I could hear on 222 MHz on the return to 2 meters to run and coordinate for 222 MHz. At 0354 UTC, 222 MHz caught fire and I managed to work five stations on SSB: W7BNH, KE7SX, W7FHI, K7NQ (repeat), and KB7DQH. Some of these stations were pushing 40 dB over S9. That was the last I heard on 222 MHz—for a while.

I continued to work stations on 2 meters and check 222 MHz for another hour during this fabulous opening. At 0500 UTC, NN7J in CN85 informed me that I was louder than ever on 2 meters and that we should try 222 MHz. After a few calls he came back on 222.1 MHz and was pinning the meter. We completed quickly. At this point I was thoroughly spent.

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VHF Plus Calendar

Aug. 2–3	ARRL UHF and Above Contest. See text for details.
Aug. 3	Moderate EME conditions.
Aug. 5	First quarter Moon.
Aug. 6	Moon perigee.
Aug. 9	Lowest Moon declination.
Aug. 10	Very poor EME conditions.
Aug. 11	Full Moon.
Aug. 13	*Perseids* meteor shower predicted peak See text for details.
Aug. 16–17	ARRL 10 GHz and Above Contest first weekend. See text for details.
Aug. 17	Moderate EME conditions.
Aug. 19	Last quarter Moon and Moon apogee.
Aug. 24	Poor EME conditions.
Aug. 24–25	Eastern VHF Conference. See text for details.
Aug. 27	New Moon.
Aug. 31	Moon perigee. Moderate EME conditions.

—EME conditions courtesy W5LUU.

The sporadic-*E* propagation continued until around 0530 UTC. For the next 30 minutes stations in northern CA were worked until the last signal faded out at 0600 UTC.

My totals for the evening were as follow: on 2 meters, 78 unique stations in 20 grids over a time span of 3 hours and 20 minutes. Twelve grids were contacted with straight sporadic-*E* propagation, seven grids in northern CA on straight FAI, and a contact in one grid (CN90) where the propagation mode waffled between sporadic-*E* and FAI *(field-aligned irregularities—ed.)*. Grids worked on 2 meters were CM87, 89, 97, 98, 99 CN80, 84, 85, 86, 87, 88, 89, 90, 95, 96, DM07, DN06, 07, 13, and 17. On 222 MHz, 9 contacts (8 unique) in 3 grids (CN85, 87 and 96) on sporadic-*E* over a time span of almost two hours.

As some have said about previous openings, the QSB on the signals on 222 MHz was very fast. When I heard the first signals on the 222 MHz band, my brain was anticipating the normal slow roll in signal strength that you see on sporadic-*E* signals on 2 meters. The QSB fade was at a significantly higher rate on 222 MHz. I wish I had turned on the digital recorder but I had a few other things making demands on my attention at that time.

From **Dave Bernhardt, N7DB** (CN85):

Monday night's opening was not just a good one, but also a historic one. I had a job to do that night that prevented me from participating as much as I would have liked, but here is a quick rundown of events.

There have been a few solar flares lately, plus just before things opened on 2 meters, there was very intense geomagnetic activity. Roughly from 0200–0300 UTC the CANOPUS page was showing a white AU oval (maximum level). Around 0300 UTC was when the 2 meter sporadic-*E* action began. Dan, NN7J, was in for virtually the whole deal and worked 16 grids and 30 contacts on 2 meters, plus, while running only 10 watts, he made two contacts on 222 MHz with W7RV and AA7A. I picked up nine QSOs in five grids myself later in the evening. Most of the action was into AZ and southern CA. NV and NM were also in there. The 2 meter action lasted until at least 0520 UTC.

There was pretty good activity from both ends as stations were spread from 144.180– 144.230 MHz. Strong

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signal levels were noted (5/9+). Certainly this 2 meter sporadic-*E* opening ups the rating for the summer 2003 *E* season.

From **Scott Townley NX7U**: "Wow, what an opening on 2 meters tonight. Worked ten stations in ID/WA/OR/BC in 1 1/2 hrs using 100W and a M2 HO-loop at 8 feet!"

From **Eric Olson, N7EPD**, on the other end of the circuit: "I got home this evening from Table Mountain, CN97, so my power supplies, amplifiers, 2 meter radio, etc., were still all packed up. I got a call that 144 and 222 MHz were open to Arizona while I was having dinner. However, time was of the essence and everything was buried in my truck. What was I gonna do? I grabbed my trusty ole FT-817 and a 7 amp-hour lead calcium battery and plugged in the 2 meter antenna coax. I worked the following stations on 2 meters with 5 watts on battery power: AA7A, DM43; N4PT, DM42 (for a new grid!); WB4LDS, DM42; K7NN, DM42; WW7B, DM33 (another new grid!); and NX7U, DM43. Wow! I missed the activity on 222, but only had 20 watts after finding a barrel connector to splice the gap left in the coax by the packed-up amp."

Other Stateside Reports

All in all, the months of May and June have been great for sporadic-*E* openings. The following reports from K5SW, K7BV, and VA6SV are typical of the activities that took place.

From **Sam Whitley, K5SW:**

On May 25, I had a "wall-banger" sporadic-*E* 144 MHz opening going. I heard the first signal at 2104 UTC. I worked WA2FGK, FN21, at 2105. I made 44 QSOs in EN91, 92; FN02, 03, 07, 12, 13, 20, 21, 30, 31, 32, 33, 35, 41, 42; and FM19, 28, and 29. The shortest skip occurred at 2139; at 682 miles was WA8RJF, EN91iq. The longest skip was at 2154 UTC, at 1357 miles, with VE2JWH, FN35pj. The last signal worked was VE2HOG, FN07gl, at 1151 miles at 2231 UTC. The total time of the opening here was 2 hours 25 minutes off and on. There was lots of courtesy, with no one "hogging" 144.200 MHz. I heard W1ZC as high as 144.220 MHz, with other activity down to 144.190 MHz. I mainly called on 144.200 MHz and said I'm going to the .204/.206 area. This certainly was a great way to start the summer sporadic-*E* season. The tipoff for me was WA2FGK saying on 50 MHz that he was going to call on 144.190. I turned up gain on 144 MHz rig on 144.200 MHz and heard him CQing. I think that I may have been his first QSO of the opening.

From **Dennis Motshenbacher, K7BV:**

Saturday, May 24th my wife made me go shopping with her—a sure promise that 6 meters would open. Sure enough, when I returned home I found the band alive with signals from the Caribbean and South America. I immediately found 9Y4AT via multi-hop sporadic-*E* at 2030 UTC. The next two hours produced quick contacts with CO's, FG, FJ, FM, FY, J3, KP4, TI, VP9, YV's, and my first Africa for the year, EH8BPX. After that the band produced stateside sporadic-*E* from OH down to FL until 0430 UTC.

Sunday action started at 1522 UTC with new VP9 and quickly heated up when I found D44TD CQing a few minutes later. A short time late I saw Said, CN8LI, spotted on DX Summit CQing on digital mode JT6M towards EU. I booted up my WSJT software and then used DX Summit to tell him I was calling him. What a fantastic surprise to have him come right back. I am certain I could not have completed the very weak signal contact without the WSJT freeware available at <http://www.vhfdx.de/wsjt/>. His QSB signal was just barely audible in and out of the noise. Thanks, K1JT!

Contacts with a third VP9 and EH8BPX were the last of the DX while the single and multi-hop sporadic-*E* action filled the band with huge signals from grid chasers, me included. Darned near gave me an ulcer knowing what was going on off the back of the beam most of the day, but I apparently made a good gamble. Huge broadcast station signals both days, but couldn't complete any EU contacts in any direction no matter what I did. I suspect that when I get the 100 ft. tower up this summer, a Yagi up there will help with some of the long-haul multi-hop stuff.

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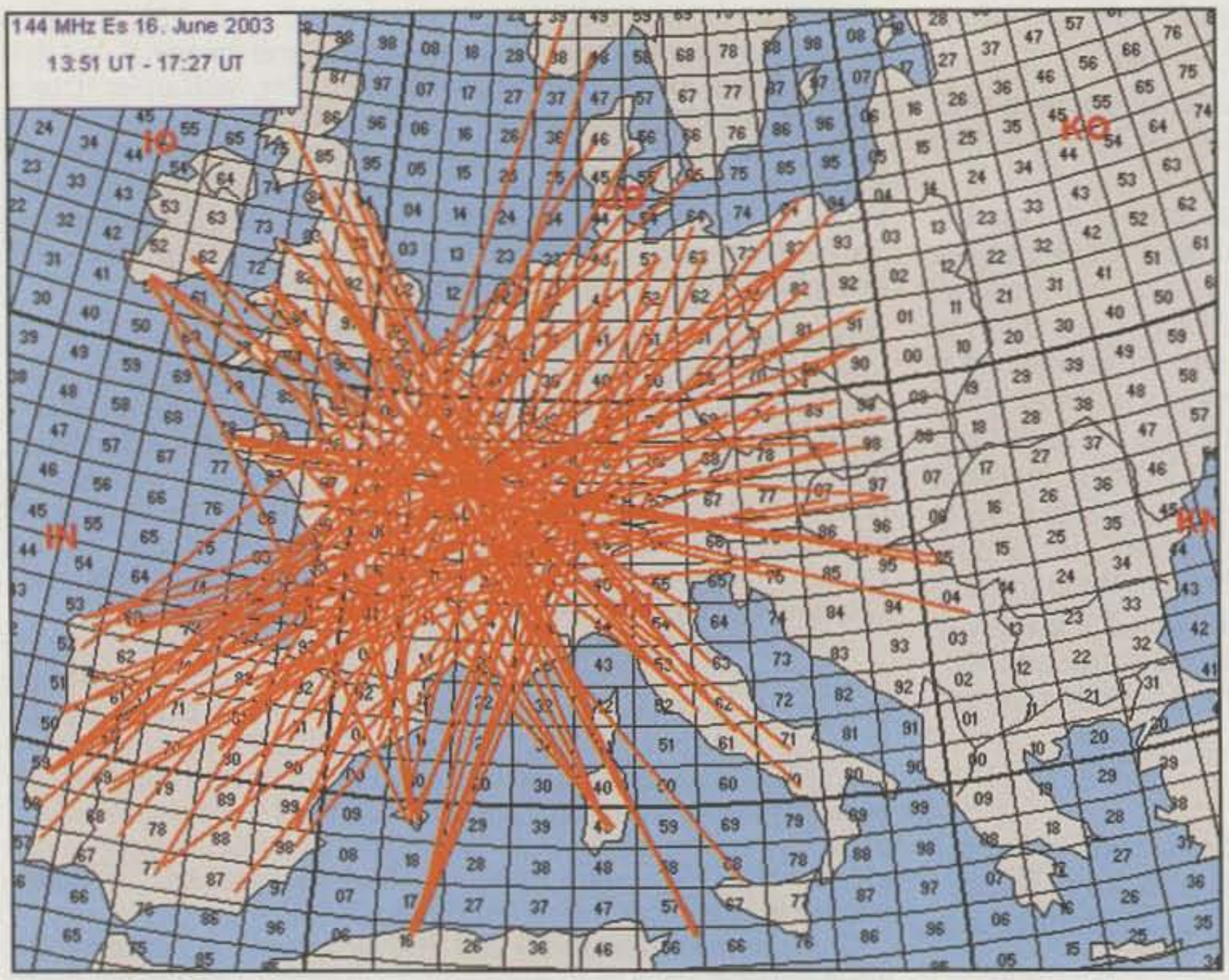

This grid map indicates the widespread European opening on June 16, 2003. Other graphs can be found at DK5YA's website: <http://www.vhfdx.de/>. (Graph courtesy of and copyright Udo, DK5YA)

Another highlight of the holiday weekend was completing a meteor-scatter contact on 6 meters with Del, K1UHF, for pure meteor-scatter state number 36 in my first 60 days of WSJT fun. The meteor-scatter crowd that hangs out on website Ping Jockey Central <http://www.pingjockey.net/cgi-bin/pingtalk/> thankfully is very helpful getting new users of WSJT software, like me, started.

From **Andy Clarke, VA6SV:**

I have been very active, but 6 meter conditions have been extremely poor this far west and north in North America—except for last evening. Here is a sporadic-*E* report for 6 meters for the evening of June 9, 2003.

What an opening! The band came alive at approximately 0200 UTC (June 10) when I saw the W7GZ beacon blasting through at 20 over S9. Then the band opened to my south, all the way up and down the west coast from BC to southern California. Signals were wonderful with lots of mobile and even QRP activity. I worked K7ESB/QRP (10 watts), W7ZOI/QRP (3 watts), and N7MYW/QRP (5 watts) with S2 to S9 signals. I saw some stations in Oregon working the East Coast, so I turned the antenna to the east and proceeded to work K1TOL in Connecticut and then K4YYL and KE8FD in South Carolina on some double-hop paths. Then I worked N5FJ in Louisiana, again double-hop skip.

I pretty much ran out of gas (not the band) at 0530 UTC and went to get some much needed rest because I had to work early the next day. I was working pile-ups 30 to 40 deep at times and it felt like a contest. The totals are as follows: 16 states (CO, WY, WI, WA, NV, CA, UT, OR, MT, ND, SC, CT, MN, LA, NM, AK) worked; 3 provinces (BC, ON, and QC) worked; and 47 grids (DN17, DN26, DN13, CN96, DN41, DN32, CN85, DN47, DN30, CN86, DN57, CN88, DN40, DN06, EM20, DM79, DN16, DN15, DN36, CN89, CN87, CN84, CN74, DN07, DN33, DM58, BP71, CN98, CN95, DM08, DN71, DN22, DN70, FN44, FN35, FN25, DN34, FN33, EM84, EM74, EN52, EM32, EN61, DM75, EN35, EM93, CM98) worked with 14 new ones! I made a total of 202 QSOs. Whew! Quite a night! I see that the band is open tonight (June 11 UTC). I hope that this report helps.

The ARRL June VHF QSO Party proved to be a mixed blessing, with some ops in the northern tiers reporting a lack of activity, such as **Paul Kelley, N1BUG**, who reported the following: "Hope everyone had fun this weekend! I quit early due to poor conditions. Do conditions get any worse? On 144/222/432 MHz I'd have to say *no*, they most certainly do not! Heavy rain on Saturday, showers and wind on Sunday. No tropo enhancement and unable to get beyond FN31 with the notable exception of FN21 on 2 meters during a very brief peak. All skeds failed. Could not work many of the usual suspects who should have been very easy Qs. On the bright side, however, there were no equipment failures."

By contrast, ops in the lower tier fared much better. **Samuel Horton, KD4ESV,** reported the following: "What a weekend. Here is list of countries worked this weekend: V25, V31, HC2, HI8, CO8, KP2, YV4, HR1, VP9, XE1, and TI2, all on 6 meters, plus lots of double hop to the West Coast. I will sure remember this weekend for long time."

144 MHz Sporadic-E European Style

Frequent and huge 144 MHz sporadic-*E* openings occurred all across Europe this past May and June. Thanks to the documentation of these openings by Udo Langenohl, DK5YA, the following summaries are presented:

May 11, 2003, first opening in 2003: DB5WC says that the first opening in 2003 probably took place at 1005 UTC from JO40 into JM88. However, we are still waiting for more logs to confirm this. The second opening started at 1422 UTC from PA (JO21) into YO. A few minutes later DL5MAE heard a UA6 station weak on 144.300 MHz and there was a UB5 for a few seconds into JN57. Then the band opened for some 25 minutes with deep QSB from PA and DL into YO. Later 9A was reported in both southern F and northern EA, but still unconfirmed.

May 19, 2003, wow, just like June: The whole day the MUF was pretty high, and from 1430 UTC there were lots of broadcast stations from Italy into UA6 and UB5, while Turkey broadcast stations were loud into HA and OE up to 105 MHz. Suddenly at 1541 UTC the band was open from UA6 and UB5 into I, ISØ, and S5 and from LZ to ISØ. After a short break the band opened from DL, PA, ON, F, G, GW, and LX into LZ, YO, UB5, S5, HA, YO, and YU. Another surprise was the opening from EA5 and EA6 into LZ, YO, and SV, which started at 1822 UTC while YU and YO were still into G and PAØ. Countries involved on this day included SV, LZ, HA, YO, YU, I, ISØ, UB5, UA6, S5, 9A, DL, F, ON, PAØ, G, GW, EA5, EA6, and SV. With almost three hours of sporadic-*E* this early in May it looks promising for 2003.

May 20, 2003, another big one: Again, the MUF was rising high pretty fast in the morning and at 1103 UTC the band was open from CT to 9H1. That one lasted for some 40 minutes. The MUF reached 144 MHz again at 1542 UTC when EA7 and EA5 were into DL and a few minutes later for CT into OE and OK. Then, surprise, suddenly EB8BTV reached the band working DL, OK, HB9, and OE. Some cracked the 3000 km mark. OK1TEH made the longest DX with 3567 km (over 1800 miles)! The cloud was moving west slowly bringing PAØ, ON, and F into the game to EA7 and EA4–5, and at 1651 UTC EA8 was 59+++ into G and later into F also. Then we saw EA7 into EI and GW and suddenly CT again into Italy, while EA8 was heard in Ireland. Wow, ping-pong across western Europe (grin). The cloud came back to the east, and EB8BTV was very busy working OK, DL (yes, me too!), and was heard in HA. At that time (1700– 1740 UTC) the MUF reached almost 220 MHz, as indi-

cated by an F station working into CT on a QRB below 800 km! EA9 came to 144 while CT was working into DL, PAØ, I, S5, and 9A and F made 7X. Great deal today! Countries involved included 9H1, CT, CT3, EA, EA8, EA9, F, G, GW, HA, EI, PAØ, ON, LX, DL, OK, OM, HB9, HA, OE, S5, 7X, 9A, and I.

May 22, 2003, a short one, but: The MUF was rising fast today after 0630 UTC concentrating over YO and SV when Turkish broadcast stations were into HA up to 108 MHz. Later the cloud was moving north and at 0925 UTC UR5GIM was into HA, OE, and DL. He even was heard in JN49 for one minute with deep QSB. At 1030 UTC there were UA's chatting on 144.300 MHz and UA taxi broadcast on FM on 144.125 MHz into JN49. No hams were around; what a mess. At the same time the band opened from SM6 to YO and from LZ to SP. It is not known how long this one lasted. The MUF was always pretty high until 1330 UTC, reaching >100 MHz again and again but nil on 144 MHz, decreasing fast after that. Countries involved included UR5, HA, DL, OE, SM, YO, LZ, and SP.

May 25, 2003, double burger with DX (grin): If it goes on like this in Europe in 2003 we'll have a season like no other before, I guess. Here we go: The MUF was rising fast in the afternoon, and at 1512 UTC the band opened from UA6 and UB5 to IT9 and I7–8 and a bit later from northern I to LZ and YO. It climbed up to almost 200 MHz, when 9A made LZ and YO, very short QRB. Around 1540 UTC DL made UB5 and OK/OM, while SP was into LZ and YO. At 1617 UTC the band closed for 1 1/2 hours. Then at 1738 UTC LZ and YO were into G and PAØ. Then the show began—a big opening from PAØ, G, ON, LX, DL, F into LZ, Z32, YO, YU, HA, UB5, SP, while Italy was working into OZ, LA, SM, northern DL, LY, SP. HB9 made UB5, too, and SP plus OK/OM was booming in southern F. That one lasted until around 1907 UTC and the MUF was again quite beyond 200 MHz! Not a ping, by the way, here in JN49. Countries involved included UA6, UB5, LZ, YO, YU, Z32, I, IT9, F, HB9, DL, OK, OM, SP, LY, SM, OZ, LA, G, GW, GJ, PAØ, ON, LX, F, 9A, and S5.

May 27, 2003, a short one: Just a short one in the morning from SM to UA4. The MUF was very high pretty early in the morning, mostly in the eastern part of Europe leading to the short opening. Countries involved today included SM and UA4.

May 29, 2003, short and spotty: A short and spotty opening took place in the late afternoon when EA1 made IØ, I7, and I8. The MUF was jumping up and down the entire day, reaching 100 MHz between G and SV and northern DL to I from time to time. Nothing else reported so far. Countries involved included EA and I.

May 31, 2003, rock-solid in southeast: Early in the morning the MUF was rising very fast above the Aegean Sea and the northwest coast of Turkey. At 0720 UTC HA was reporting broadcast stations from OD5 and 4X4, and at 0750 UTC 144 MHz opened from 4X4 to LZ, YO, and HA. OD5/OK1MU was on the road south of Beirut, stopped his car, and went back home very fast, which was a good idea because 144 MHz was still open when he arrived in his shack at 0950 UTC. Later he was working into YU and T94 while 4X4 was into 9A, HA, YO, YU, and LZ. The band closed at 1026 UTC. Countries involved included 4X4, OD5, LZ, YO, 9A, and YU.

June 2, 2003, high MUF: The MUF was high the whole day, leading to a first opening at 1209 UTC from ISØ to LZ. That one lasted until 1217 UTC. At 1235 UTC the band opened from I and DL to SV until 1338 UTC; more meteor scatter than sporadic-*E*, some say. Later in the afternoon the MUF was always close to 144 MHz, but the "final jump" occurred at 1709 UTC when YO was into F. A bit later F was working into UB5 while LZ was into HB9. Again LZ and YO into F and SV8/DL5MAE was busy with I and ISØ. At 1807 UTC he was on 144.300 MHz in a big pile-up until 1841 UTC, working I, DL, PAØ, F, and ON. SV3 made OZ this time, while SV8DTD was into DL and PAØ. In addition, LZ was into HB9 and DL. SV8/DL5MAE was also heard in G as well as some LZ's. The last signals were heard at 1841 UTC. Countries involved today included SV, LZ, YO, UB5, I, ISØ, F, HB9, DL, PAØ, ON, and OZ.

June 4, 2003, nice one late in the evening: The day started very poor; even 50 MHz was dead as a doornail until noon. Early in the afternoon a few sporadic-*E* clouds formed both in the eastern and western part of

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Europe. The one above Biscay finally crossed the "magic line" at 1900 UTC, when suddenly lots of broadcast stations were into UK and EI. At 1930 UTC 144 MHz opened from EA5, 6, and 7 into G, GW, EI, GI, and PAØ. The MUF was like a yo-yo, up and down. However, at 2017 UTC the sporadic-*E* came back much stronger, now also to DL, ON, OK, OZ, and HB9, and EA and EA6 still pretty strong into G and EI. The widespread opening continued until 2112 UTC. Countries involved included G, GW, GI, EI, PAØ, ON, OZ, OK, DL, HB9, EA, EA6, and CT.

June 5, 2003, Atlantic cloud: The entire day the MUF was high, far beyond 144 MHz in the late morning above southern Spain when f0Es was >15 MHz. Unfortunately, there were no QSOs reported. In the late afternoon there was a short opening from CT and EA to GM. The sporadic-*E* cloud was moving back and forth west of France. There were lots of EA broadcast stations into OE, OK, and DL from 1750 until 1830 UTC; nil after that. Countries involved included CT, GM, and EA.

June 6, 2003, twice a day: The MUF was low in the morning, rising slowly today. Many were concentrating on 50 MHz because there was a huge opening across the pond to stateside via multi-hop. At 1300 UTC F reported lots of broadcast stations from EA suddenly, and at 13:34 UTC 144 MHz was open from EA8 to F and G. That one was short and spotty again. The MUF went up and down in the afternoon, with no sign of another opening. However, at 1720 UTC EA broadcast stations came back on into PAØ and DL, while Italy was into EI up to 108 MHz. Around 1740 UTC 144 MHz was open again, this time from EI to southern I, F to northern I, and from G, DL, PA, OZ, and OK into EA and CT. The opening lasted until approximately 1851 UTC. Countries involved today included CT, G, GW, EA, EA8, EI, PAØ, ON, F, DL, OZ, OK, and I.

June 9, 2003, eastern Europe made it today: Early in the morning the MUF was very high from mid-Europe to the east. RZ6BU had DL and OE broadcast stations up to 108 MHz early and that looked promising. At 0815 UTC came the first loud and long burst from UR to YU and S5, and at 0833 UTC UR5LX was into YU on 144 MHz and few minutes later into S5 also. A little later the band was wide open to UR and UA6 from F, DL, S5, YU, OE, and OK, and SP to UR, UA6, and a few UA3s also. It was a pity that so many UR stations were on 50 MHz and didn't want to QSY to 144 MHz. A UA6 was even heard into PAØ. Later another cloud formed above SP and we had short openings from HB9 and DL into OH, while LA, OZ, and SM were into YU, LZ, and S5. The band closed at 1037 UTC. The next (and huge!) opening on 144 MHz started at 1515 UTC when UA6 was into UA1 and UA3, and UA4 into LY. Later UA4 was into UB5 and LZ, while LY made UN (>2.400 km on FM!). The cloud was moving west now and SP made UA4 also. Back east OH and ER made a huge amount of UA4 and UA6 contacts on FM, so much so that it was hard to read the cluster spots here in DL. By the way, the MUF was very high, >200 MHz. The opening lasted until approximately 1710 UTC. Countries involved included F, DL, OZ, SM, LA, OH, OK, SP, OE, S5, YU, LZ, ER, ES, UR, UA3, UA4, UA6, and UN.

June 10, 2003, a spotty one in Spain: A spotty opening that looked promising occurred at around midnight from June 9–10. The MUF reached very high levels in the middle of the night, when there were broadcast stations from UA to DL and DL and OK/OE very loud up to 108 MHz in UA6. This was a rare and strange thing. However, in the early morning the nice cloud was gone. Nothing special happened during the day. The MUF was around 60/70 MHz from time to time. Later in the afternoon a new cloud appeared in the very southwestern part of Europe, and at 1758 UTC EA8 was loud and clear to northeastern Spain. While the cloud was moving west very slowly, the boys from southwest France took the chance to work EA8. Deep QSB and short openings occurred until 1917 UTC also at the north-coast of the peninsula. Countries involved included EA8, EA, and F.

June 12, 2003, short opening for UA6: The MUF was very low in mid and western Europe in the morning and until the afternoon, while there was a high ionized cloud between southern Russia and the Arabic countries early in the morning. That cloud moved slowly northeast, and in the afternoon the MUF was rising up to 144 MHz and it was again Gennadij, RZ6BU, who was there at the right moment. A short opening occurred from UA6 to SV. Nothing else reported so far.

June 13, 2003, small clouds, short openings: The MUF was very low in Europe until early afternoon. Even 50 MHz was totally dead until approximately 1500 UTC, when the first signals appeared between F, G, and DL to I, 9H1, and 4X4. There was a cloud in the southwestern part of the Mediterranean Sea that caused a short 144 MHz openings from southwest F to IT9 (Pantelleria Island) and later from I7 to EA9 from 1538 until 1615 UTC. Still later at approximately 1640 UTC the band opened from EA and EA6 to I7–8 and SV3. That was a nice, good opening, but activity was very poor! Countries involved included F, EA, EA6, EA9, I, IT9, and SV.

June 16, 2003, the big punch: What a nice, big cloud today. The whole part of southern France was covered with a very high MUF cloud from the early afternoon, causing a huge opening that lasted for $3^1/2$ hours. The first signals on 144 MHz were at 1351 UTC, when GM was into IW9, Pantelleria Island, a very rare one. Then it was a few minutes later when the big show began. A tremendous opening occurred in western Europe, all across southern France. Several EA stations were in with 59+++ signals into DL and PAØ for two hours. Again, there was terrible chaos on 144.300 MHz. Why don't you spread out, folks? Furthermore, why are so many calling CQ endlessly on 144.300 MHz, even from DL and PAØ when that QRG is crowded by DX? *(Do these laments sound familiar on this side of the Atlantic?—ed.)* This was the best one in 2003 to date. However, there's sure to be more to come! Countries involved included CT, EA, EA6, F, EI, GM, GW, GJ, PAØ, ON, LX, DL, OZ, LA, SM, SP, OK, OM, HA, OE, HB9, S5, 9A, I, IW9, ISØ , TK, YU, and 7X.

June 17, 2003, "Two sisters": Is sporadic-*E* becoming a usual mode on 2 meters? It seems so, because we had another opening today. It was a very unusual one also because there were two different clouds active at the same time. The MUF was very high in the early morning, reaching 144 MHz at 0735 UTC for some ten minutes from DL to I7/8 and SV but no one QRV in Greece. Later in the afternoon the MUF was rising again very fast both above northern DL and the mid

On the Cover

Herb "Cal" Calvitto, WA1WOK, of Nottingham, New Hampshire, says his 18 ft. Princecraft pontoon boat is "the perfect size for trolling for the elusive DX." Indeed, Cal says he regularly talks all over the world from his marine-mobile station, consisting of an ICOM IC-706 MkII-G transceiver, a screwdriver antenna mounted just four to six inches off the water, and a "988-acre ground plane" called Lake Pawtuckaway.

Cal says he operates all bands between 75 meters and 70 centimeters, with his favorite being "anything that's open." Cal's contacts from the boat include stations in Thailand, Australia, and several former Soviet republics, along with regular visits by radio to Spain and England. On his first weekend with the radio aboard the boat, which happened to be Field Day 2001, Cal worked 44 states on 40 meters with 40 watts in just under 12 hours!

WA1WOK is also an avid packet operator, running seven nodes around New Hampshire, plus the state's only packet bulletin-board system, or PBBS. The packet network ties in well with Cal's job as a Communications Specialist for the New Hampshire State Office of Emergency Management. His responsibilities there include being the ARES (Amateur Radio Emergency Service), RACES (Radio Amateur Civil Emergency Service), and MARS (Military Affiliate Radio System) coordinator for the State OEM. (Cover photo by Larry Mulvehill, WB2ZPI)

Adriatic Sea. At 1548 UTC DLs were heard in ISØ, and a little later 144 MHz was wide open from F to HA. Then suddenly SV was into DL and PAØ. At almost the same time the cloud above JO63 reached 144 MHz and G hade a huge opening to SP. This cloud later made UA1 and UA3 as well as EW and LY available for both G and PAØ, while Italy was working into OZ and LA and 9A was having a big one to SM2/3. Even southern DL made LA and a minute later again SV. Now that's strange. The southern cloud also brought UT5 into the game with F and EA, while EA5 and EA6 made LZ and YO. Countries involved today included: EA, EA6, TK, F, G, GI, GM, GW, PAØ, ON, LX, DL, OZ, LA, SM, LY, UA1, UA3, EW, SP, HA, HB9, S5, 9A, I, IW9, LZ, YO, Z32, SV, SV9, and 9H1.

June 18, 2003, Early bird and late one also: There was a nice opening for the boys from UA6 and UT5 because it was very early in the morning and there was a first today. At 0500 UTC the broadcast band was crowded with Arab stations at RZ6BU. At 0550 UTC lots of unlicensed stations from different Arabic countries were being heard on 144 MHz by RZ6BU. Finally, at 0712 RZ6BU made contact with three different SU stations on 144 in FM! Congratulations! At the same time UT5 was working 4X4 and there were lots of unlicensed and Arabic music stations on 144 MHz being heard in LZ. The opening lasted for more than two hours, but only a small number of QSOs took place due to the very low activity in these countries. Later in the afternoon the MUF suddenly rose very fast up to 144 MHz from DL to SV at 1700 UTC. The first signal on 144 MHz at 1722 UTC was SV3CYR, who was into DL. A bit later SV1OE reached the band while LZ was into F. The cloud then moved north for G to YO and SV and PAØ to SV and LZ and YO. Finally, a short and spotty opening occurred that lasted until 1814 UTC. Countries involved today included: UT5, UA6, 4X4, OD5, SU, SV, LZ, YO, F, DL, ON, PAØ, and G.

Further reports from Udo will be in next month's column. Also, an article summarizing what took place in Europe over the late spring and summer is slated for the fall issue of *CQ VHF* magazine. My thanks go to Udo for graciously granting permission for *CQ* to publish his journal here. For more details, see his website: <http://www.vhfdx.de/>.

Current Conference

This year's **Eastern VHF-UHF Conference** will be held in Enfield, Connecticut August 22–24. For more information see: <http://www.newsvhf.com/>.

Call for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings*, or both. For more information, questions about format, media, hardcopy, email, etc., contact the person listed with the announcement.

22nd Annual ARRL and TAPR Digital Communications Conference (September 19–21): Contact Maty Weinberg at <maty@arrl.org>. The deadline for submitting papers is August 5, 2003.

Current Contests

There are two important contests this month. The **ARRL UHF and Above Contest** is scheduled for 2–3 August. Complete rules can be found in the July issue of *QST*. The first weekend of the **ARRL 10 GHz** and above cumulative contest is scheduled for August 16–17. The second weekend is September 20–21. Complete rules for this contest can be found in the July issue of *QST*. Rules can also be found on the League's website, <www.arrl.org>.

Current Meteor Showers

The *Perseids* meteor shower's predicted peak is around 0440 UTC August 13. Visually this year's shower will be blocked by a near full Moon. Also look for secondary peaks at approximately 0240 and 1440 UTC. It seems that this year no one is predicting an intensity level for this shower because of the problem with visibility. However, this shouldn't stop us "ping jockeys" from making a go of it. Incidentally, a fascinating story of the discovery of the *Perseids* meteor shower can be found on the *Sky and Telescope* magazine website at: <http://skyandtelescope.com/observing/objects/meteors/article_124_1.asp>.

And Finally . . .

For the most part this month's column was devoted to reports, which is as it should be, since this past late spring and early summer have been very good for sporadic-*E* enthusiasts. There has been plenty of activity on 6 meters and good openings on 2 meters, and record-setting openings on 222 MHz.

One more thing: Please read the "Propagation" column by Tomas Hood, NW7US, for reports on how the solar flares affected propagation this past reporting cycle. Also, check out Tomas's new column in the summer issue of *CQ VHF* magazine. Until next month...

73, Joe, N6CL

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awards

BY TED MELINOSKY,* K1BV

Will LOTW Be Accepted for USA-CA?

After four decades your "Awards" columnist has finished up working all U.S. counties, as shown in the accompanying Honor Roll boxes. This completed a journey started when Clif Evans, K6BX, held the job as *CQ*'s awards editor back in the early 1960s. Most people who complete USA-CA finish up in a lot less time than I did, but it just goes to show the value of persistence. Special thanks to David Splitt, KE3VV, for making a trip to Somerset County on Maryland's eastern shore so I could finish USA-CA.

Q&A on County Hunting and USA-CA

Q: Will CQ be accepting ARRL Logbook of the World (LOTW) electronic log listings for USA-CA?

A: The ARRL has begun testing of their Logbook of the World (LOTW) system. While it seems that the first awards program to be affected will be DXCC, there is potential for others as well, including CQ's awards program. It is too early to predict how and when it will affect USA-CA. For the present time, physical possession of the QSLs and MRCs (Mobile Reply Coupons) will be required before an application is submitted.

Q: What is the charge for USA-CA endorsement stickers?

A: If you currently have a USA-CA certificate, the charge for any endorsement is $1.25. This is a flat charge no matter how many endorsement seals are requested. In the most extreme case, you may receive seals for 1000, 1500, 2000, 2500, and 3077 counties in one transaction for $1.25. I encourage county hunters to submit their first application for the award at the 500 level. You'll be able to frame the award in your shack to impress all your visitors, and then add seals and ribbons as you progress toward completion. Of course, you will have to remove the certificate from the frame to add the endorsements, but that just adds to the pleasure of seeing your progress.

Q: Do I have to make all county contacts from within the same county of the USA?

A: No. There are no location restrictions affecting your ability to count every county you work. I made county contacts from seven fixed locations in five states plus many mobile locations over a 40 year period, and all of them counted for the award. Similarly, there are no band limitations affecting your ability to work valid counties. HF, WARC, VHF, UHF, SHF—they all count as long as they are frequencies you are licensed to use.

Q: I was looking at my MRCs recently and noticed that some of them were signed with rubber stamps. Are these valid?

A: The USA-CA rules are silent on this subject. The highly regulated DXCC permits the use of a rubber stamp, and as QSL manager for D4B, D44TT, and EY8MM, I use one of the circular rubber stamps and this has never been challenged. The USA-CA program will accept a rubber stamp as long as it is unique enough to identify the signer.

Q: I have a QSL showing the county as Staten Island, but QRZ.com shows the county as Richmond. What's going on?

A: Richmond County is the proper name for any contact made with Staten Island, New York. The current *USA-CA Counties Award Record Book* shows the old name of Staten Island, and this will be corrected at the time of the next reprint.

Q: I recently worked several mobile stations during state QSO parties. The county was written in by the operator, but not the city or town except for the printed fixed location. How is this handled in record-keeping with *CQ*'s *Record Book*?

A: Just record mobile contacts as "mobile" in the space that says "city or town." It's understood that a mobile does not record precise location for each contact, nor is this needed. What counts is a clear indication of the county at the time of contact.

*12 Wells Woods Rd., Columbia, CT 06237
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USA-CA Special Honor Roll

Ted Melinosky, K1BV
USA-CA All Counties #1066
May 21, 2003

USA-CA Honor Roll

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Sponsored by the Marinefunkerclub Austria, the Tegetthoff Diplom is issued in remembrance of Admiral Wilhelm von Tegethoff. Contacts with naval amateur radio clubs in Europe count for the award.

club in commemoration of the 280th anniversary of the city of Perm, Russia. The goal is to contact stations in Perm city and the Perm oblast between January 1, 2003 and June 12, 2004. No band or mode restrictions. SWL okay. Earn 280 points; each station in Perm city counts 10 points; those in Perm oblast count 5 points. During the week of June 12–19, 2003 there will be some celebrations, and QSOs during that week will be count for 50 points. Each station may be worked only once regardless of bands and modes used.

There is no fee for the award, only $3 (Russians 50 rubles; other CIS countries $1) for mailing costs. Send log extract to: Sergio B. Noskov, RA9FDR, P.O. Box 172, Perm 614056, Russia. No applications will be accepted after January 1, 2005.

The stations of Perm are as follows:

RA9 FA, FAL, FAN, FAP, FAQ, FAV, FBB, FBC, FBM, FCC, FCD, FCE, FCF, FCI, FCP, FCZ, FDB, FDG, FDK, FDM, FDO, FDR, FDY, FEB, FEC, FEE, FEH, FEL, FEP, FEW, FEX, FFA, FFB, FFC, FFE, FFG, FFK, FFO, FFP, FFT, FGD, FGF, FGK, FGM, FGV, FGZ, FHB, FHI, FHO, FHW, FI, FIC, FID, FIE, FIF, FIJ, FIM, FIN, FIO, FIP, FIQ, FIR, FIT, FIW, FJA, FJL, FJM, FJQ, FJZ, FKA, FKH, FKN, FKP, FKQ, FKT, FKU, FL, FLC, FLG, FLJ, FLN, FLO, FLP, FLU, FLW, FLX, FM, FMC, FMG, FMK, FMN, FMT, FMU, FMZ, 9FN, FNC, FNE, FNI, FNN, FNP, FNT, FNU, FNZ, FO, FOA, FOC, FOI, FOK, FON, FOQ, FOR, FOV, FOX, FP, FPE, FPF, FPG, FPN, FPT, FQF, FQG, FQH, FQI, FQJ, FQK, FQT, FQY, FR, FRB, FRD, FRF, FRI, FRK, FRL, FRM, FRN, FRO, FRR, FRS, FRT, FRW, FRY, FSB, FSC, FSD, FSE, FSF, FSG, FSH, FSI, FSL, FST, FSW, FSZ, FTH, FTI, FTM, FTP, FTZ, FU, FUC, FUH, FUM, FUN, FUO, FUQ, FUS, FUT, FUV, FUW, FUX, FUY, FUZ, FVA, FVC, FVD, FVG, FVI, FVK, FVL, FVM, FVN, FVO, FVQ, FVR, FVS, FVT, FVX, FVZ RK9-FAC, FAE, FAF, FAH, FAI, FAJ, FAK, FAL, FAM, FAN, FAO, FAP, FAR, FAT. **RU9** FD, FL, FZ, GB. **RV9** FA, FF, FG, FM, FQ, FZ. **RW9** FF, FZ. **RX9** FB, FJ, FM, FN, FW, FX. **RZ9** FA, FM.

UA9 FA, FAC, FAD, FAE, FAL, FAM, FAQ, FAR, FAT, FAX, FB, FBA, FBB, FBC, FBI, FBJ, FBM, FBR, FBV, FCC, FCI, FCU, FDI, FDN, FDZ, FED, FEG, FER, FEX, FFC, FFD, FFF, FFS, FFV, FFW, FGM, FGO, FGR, FGU, FGW, FGZ, FHM, FHP, FIJ, FIK, FIT, FIV, FJ, FKB, FKY, FL, FLB, FLK, FLL, FLO, FLP, FM, FMM, FMO, FNF, FNH, FNI, FNM, FO, FOC, FOL, FOS, FOU, FPC, FPN, FQZ, FR, FRA, FRL, FU, FV, FX, FZ, GK, GL.

Austria's Tegetthoff Diplom

Several European countries have active naval amateur radio clubs composed of members who serve or have served in their respective country's navy. The QSLs of these clubs often have a naval topic, such as a picture of a ship, and you may see the word *Marinefunkerclub* and a member number. These cards are generally good for at least one or two awards. In the case of the following award, members from a large number of countries will help provide enough points to put you in close range of this handsome Austrian certificate.

Sponsored by the MFCA (Marinefunkerclub Austria), the Tegetthoff Diplom is issued in remembrance of the famous admiral Wilhelm von Tegethoff. Contacts on or after April 21, 1997 (the date of the foundation of MFCA) count for the award. Contacts with naval amateur radio clubs such as the following count for the award: MF Germany, BMARS Belgium, RNARS UK, MARAC Netherlands, INORC Italy, FNARS Finland, YO-MARC Romania, ANARS Australia, and MARCOM eastern Germany. SWL okay. HF contacts only. (There is a separate award for VHF.) The award is available for mixed phone and CW, all CW, all phone, or SWL. Each group has three levels available: Class 1 "Gold" (250 points), Class 2 "Silver" (100 points), and Class 3 "bronze" (50 points).

Points are counted as follows:

1. MFCA members (at least 10 of them) in Europe—2 points each.
2. MFCA members /MM—3 points each.
3. MFCA members outside Europe—3 points.
4. Members of other maritime amateur radio clubs—1 point each.

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5. Members of other maritime amateur radio clubs /MM—2 points each.

6. Club stations of these naval clubs —3 points each.

7. Special naval club stations which count on SSB (CW contacts count for double points):

a. OE6XMF (club station of MCA) is obligatory—5 points.

b. DL9CUX (*Elbe 1* fire vessel)—4 points.

c. OE6XMF/MM—5 points.

d.OE6XMF/- - - (special events from submarines, museumships, light towers, etc.)—5 points (only once), 2 points for further contacts with other /- - - .

The same call may be worked for credit on a different mode. Application should include membership number of the station contacted. Send excerpt of your log and fee of 15 Euros to Sepp Langer, OE3OLC, Birkengasse 25, A-3172 Ramsau, Austria (e-mail <langer.oe3olc@aon.at>).

Greece's R.A.A.G. Award Series

This month's featured award series comes from Greece with images provided by Monos Darkadakis, SV1IW. Look for our Greek friends to provide plenty of opportunity for contacts as they get ready to host the 2004 Summer Olympics, only a year away.

General Requirements: Fee for each award is 5 Euros, $US5, or 10 IRCs. Apply to: R.A.A.G., Award Manager, P.O. Box 3564, 10210 Athens, Greece. Awardsare issued for SSB, CW, mixed, or single mode.

Alexander the Great Award. Confirm contact with countries crossed by Alexander the Great on or after January 1, 1958. Only one contact from each country may be used, except for Greece, which requires two contacts, one of them from the SV2 call area of Macedonia. All bands and modes may be used.

One of the R.A.A.G. award series, the Alexander the Great Award is issued for contacts with countries crossed by Alexander the Great.

The Athenian Award (R.A.A.G. series) is given for contacts with 25 stations in the Athens area.

Class 1—contact 15 of the countries.

Class 2—contact 25 of the countries (certificate and plaque awarded).

Send QSLs unless certification is made by an IARU-affiliated national society awards manager. Fee for Class 1 is 5 IRCs; for Class 2 (which includes plaque) 25 IRCs.

Countries through which Alexander the Great passed: SV Greece, SV2 Macedonia, SV2 Mt. Athos, SV5 Dodecanese, ZA Albania, Z3 Fyrom, LZ Bulgaria, VU India, 4K Azerbaijan. E4 Palestine, TA Turkey, YK Syria, 4X Israel, OD Lebanon, SU Egypt, 5A Libya, YI Iraq, EP Iran, AP Pakistan, YA Afghanistan, EZ Turkmenistan, EY Tajikistan, UJ Uzbekistan, JY Jordan, EK Armenia.

Athenian Award. This a is issued for contacts with 25 stations in the Athens area, any mode, in the following three classes:

Class 1—QSOs on 160 and 80 meters.

Class 2—QSOs on 40 and 30 meters.

Class 3—QSOs on other bands.

Endorsement stickers are available for each 25 new contacts.

Greek Islands Award. Work and confirm ten contacts in at least three groups of the Greek islands as follows: Crete, Euboea, Dodecanese, Lesbos, Ionian, Khios, Cyclades, Thasos-Samothraki, Sporades, Ikaria-Limnos. Mixed-mode or single-band endorsement stickers for every ten different islands.

To earn the R.A.A.G. Greek Islands award work and confirm ten contacts in at least three groups of the Greek islands as listed in the text.

Confirm contacts with at least seven Greek stations from any of the nine call areas, SV1–9, to be issued the R.A.A.G. Award.

R.A.A.G. Award. Contact stations located in Greece after January 1, 1975. Submit verified list of contacts with at least seven Greek stations from any of the nine call areas, SV1 to SV9. No band or mode limitations.

URL of the Month

The Radio Society of Bermuda hosts a very informative website at <http://bermudashorts.bm/rsb/>. It has links to a number of topics, including information for visiting amateurs, contesting in VP9, and the society's very well done awards series. Two of the six listed awards are available to any amateur in the world. The Worked All Bermuda Award requires contacts with all nine island parishes and is personally signed by the governor of the island. Best of all, the award is free of charge. It's worth a visit to the site.

I'm still looking for the samples and rules for your club's award. Publicity is the key to a successful awards program, and *CQ* is an excellent way to get the word out. 73, Ted, K1BV

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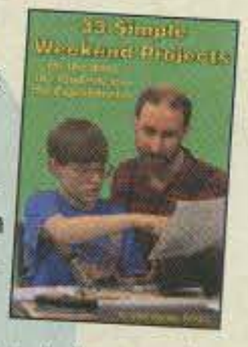

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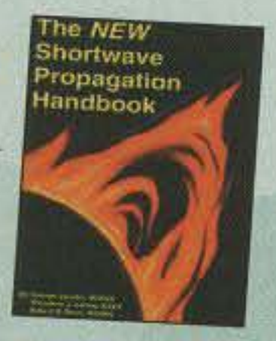

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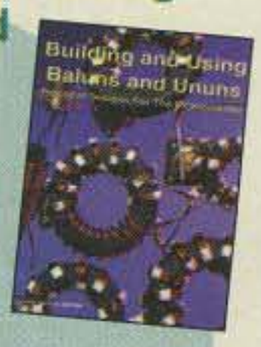

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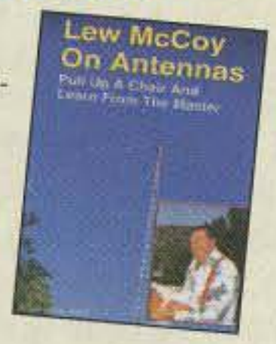

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BY TOMAS HOOD,* NW7US

Increased Geomagnetic Activity and Sporadic-*E*

As is typical of all solar cycles studied since Solar Cycle 11, the smoothed monthly planetary *A* (*Ap*) index for this cycle is peaking somewhat after the peak of the smoothed sunspot activity. HF band conditions have often been terrible despite occasional rises in sunspot activity. Some of this is due to the lower solar activity and the occasional flare activity. Most of the degradation, however, is caused by a seasonal increase in geomagnetic activity, as well as the second peaking of geomagnetic activity during this cycle. While we are still experiencing occasional moderate to high levels of solar activity, don't expect high sunspot counts and related high 10.7 cm flux readings too often or for prolonged periods. The average smoothed sunspot and flux counts are falling below the peaks observed during the last few years. At the same time, the *Ap* counts have climbed, as expected. Take a look at the ISES Solar Cycle *Ap* Progression chart at <http://www.sec.noaa.gov/SolarCycle/>, which shows the steady increase of the *Ap* after January 2002.

Studies of geomagnetic cycles since Solar Cycle 11 indicate that the level of geomagnetic activity does not peak at sunspot maximum. Instead, the geomagnetic activity during an 11-year solar cycle peaks twice. The first peak occurs slightly before the maximum, and then the major peak occurs in the declining phase of the cycle. The second and more intense peak is caused by an increased number of coronal holes, which produce an unrestricted outward flow of solar plasma into interplanetary space. A coronal hole is a breakdown in the magnetic fields in the solar corona. When the Earth passes through one of these solar streamers, a disturbance in the Earth's magnetic field results. Coronal holes occur more often during the decline of a solar cycle. They are the primary source of geomagnetic storms during solar minimum. Indirectly, these geomagnetic storms cause ionospheric recombination and degradation, causing the maximum usable frequencies (MUFs) to become lower than the sunspot activity supports.

VHF and higher propagation modes may be, and often are, enhanced during these days of high geomagnetic storminess and ionospheric activity. In addition, the seasonal peak of sporadic-*E* activity has been observed well into July 2003.

The world's official keeper of sunspot records, The Royal Observatory of Belgium, reports an observed monthly mean sunspot number of 55 for May 2003, down five points from April. The 12-month running smoothed sunspot number centered on November 2002 is 151, down eight points from October. The sunspot minimum for May 2003 was 17 on May 10. The sunspot maximum of 99 occurred on May 1.

A 10.7 cm observed monthly mean solar flux of 116 was reported by the Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, for May 2003, down from 127 for April and from March's 164. The 12-month smoothed 10.7 cm flux centered on November 2002 is 154, down six points from October.

*P.O. Box 213, Brinnon, WA 98320-0213
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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for August 2003

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 6-7, 26-27	A	A	B	C
High Normal: 5, 9, 11, 16, 21-22	A	B	C	C-D
Low Normal: 1-4, 12-15, 17, 24-25, 28-31	B	C-B	C-D	D-E
Below Normal: 8, 10, 18, 23	C	C-D	D-E	E
Disturbed: 19-20	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.
2. With the *propagation index,* use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be fair to good (C-B) on August 1–4, good (B) on the 5th, excellent (A) on the 6th and 7th, etc.

The observed monthly mean planetary *A*-index (*Ap*) for May is 24, up four points from an *Ap* of 20 for April. The 12-month smoothed *Ap*-index centered on November 2002 is 16.

A smoothed sunspot level of 50 and a 10.7 cm solar flux of about 106 are predicted for August 2003. Geomagnetic activity will be active to stormy. Expect a number of days with coronal mass ejection (CME) activity and occasional solar flares.

August Propagation

Late August, early September is a difficult time of year for which to make accurate band predictions because conditions can change drastically from day to day. On many days typical summertime conditions will continue much as they were during June and July. On other days conditions are more like those of the fall season, with somewhat higher daytime frequencies and somewhat lower nighttime usable frequencies. Add to this the seasonal equinoctial conditions that can begin as early as late August. This often can result in optimum openings between the Northern and Southern Hemispheres on the one hand, but periods of severe radio storminess on the other.

Since this is a period of transition, this month's DX Propagation Charts cover only the one-month period from August 15th through September 15th, rather than the usual two-month period. Short-Skip charts for use during this period appeared in last month's column.

Being in mid-summer and being in the decline of Solar Cycle 23 with lower 10.7 cm flux numbers, 17 and 20 meters will be the most usable daytime DX bands. The low bands are too noisy and experience a high amount of absorption. The higher bands (10 and 12 meters) are mostly dead now except during the occasional sporadic-*E* opening. Fifteen through 20 meters will have a fair number of openings in the

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morning and evening hours following the grayline, with the strongest peaks during the afternoon. However, 20 meters is where August activity will be strongest.

Occasional fair DX openings might occur on 10 and 12 meters during the hours of daylight, particularly along an arc extending across central Africa, Latin America, and into the far Pacific area. Openings on these higher frequencies may occur after a period of high solar activity, but the average solar activity is quite a bit lower now than during the peak of the cycle a few years ago. When openings occur, peak conditions should happen during the afternoon hours. DX openings on 20 and 17 meters will occur throughout the daylight hours. Peak signals are expected during an approximate two-hour window immediately following sunrise and again during the late afternoon.

Between sundown and sunrise 20 meters is expected to be the best DX band. Openings should be possible to nearly all areas of the world, often with exceptionally strong signal levels. Until midnight, good DX conditions may be found on 15 and 17 meters for openings toward Latin America, the far Pacific, and into Asia. Fairly good nighttime DX conditions are also expected on 30, 40, and 80 meters despite the high static at times. Openings should be possible before midnight along an arc extending from northern Europe, through Africa, and into Latin America.

By late August it should be possible to work some DX on 160 meters during the hours of darkness. Conditions on this band, as well as on 40 and 80 meters, will tend to peak just as the sun begins to rise on the light, or easternmost, terminal of a path.

Short-Skip Conditions

For openings over distances ranging between 50 and 250 miles use 80 and 40 meters during the day and 80 and 160 meters at night. Between 250 and 750 miles the best bands should be 40 and 30 meters during the day and 40 and 80 meters at night. For openings between 750 and 1300 miles, the best bands should be 20 and 17 meters during the day, with some fairly good openings also possible on 15 meters. From sundown to midnight try 40 and 30 meters. From midnight to sunrise try 80 meters. Between 1300 and 2300 miles the best daytime band should be 20 and 17 meters, with some activity on 15. Try 30 and 40 meters during the hours of darkness.

VHF Conditions

Sporadic-*E* propagation usually tapers off toward the end of August, but should continue to occur fairly frequently. Some 6 meter openings may still be possible over distances of about 750 to 1300 miles. During periods of intense and widespread sporadic-*E* ionization, two-hop openings may be possible considerably beyond this range. Don't forget to check 2 meters for an occasional sporadic-*E* opening between 1200 and 1400 miles. Look for these to peak between 8 AM and noon and again between 6 and 9 PM local time.

Solar activity may be high enough to support a rare *F*-layer DX opening. During the daylight hours monitor 6 meters for transcontinental openings, as well as between Hawaii and the western states, and the Caribbean and Central and South America. The best time to look for these openings are during the afternoon hours, especially when conditions are High Normal or better. You just might be surprised.

For the very patient, check the 6 meter band for possible trans-equatorial (TE) openings between 8 and 11 PM local daylight time. This type of propagation favors openings from the southern tier states deep into South America, with the signal path crossing the magnetic equator at a right angle. TE openings during August are rare, but they can occur. Very weak signals and severe flutter fading usually characterize them.

The major meteor shower activity this month is the *Perseids* on July 23 through August 22, peaking on August 13. Moderate meteor activity is offered by the *Northern Iota Aquarids,* between August 11 and September 10, peaking on August 25 and 26; the *Southern Iota Aquarids* from July 1 through September 18, peaking on August 6 and 7; the *Alpha Capricornids* from July 15 through September 11, peaking on August 1 and 2; the *Northern Delta Aquarids* from July 16 through September 10, peaking on August 13 and 14; and the *Kappa Cygnids* from July 26 through September 1, peaking on August 18. Minor activity is offered by the *August Eridanids,* from August 2 through August 27, peaking August 11 and 12; the *Upsilon Pegasids* from July 25 through August 19, peaking on August 8 and 9; and the *Alpha Ursa Majorids,* from August 9 through 30, peaking on August 13 and 14. Ionization produced by these meteor showers, particularly during the period of maximum intensity, is expected to make possible frequent meteor-scatter-type openings on 6 and 2 meters over distances of several hundred miles. I've personally worked 6 meter stations between my location in western Washington into California and Montana during one meteor shower.

Continue to expect a high number of solar flares and coronal mass ejections, possibly triggering aurora during August and September. When the *Kp*-index is greater than 5, you can expect possible

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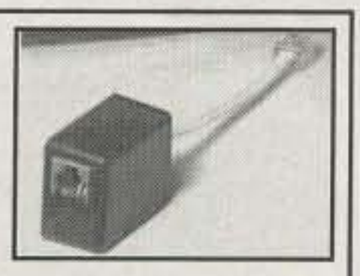
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aurora. The higher the *Kp*-index, the more intense the aurora can become. Consult the Last-Minute Forecast at the beginning of this column to find those days that are forecast to be Disturbed or Below Normal. You may also visit my propagation page, <http://prop.hfradio.org/>, to view current conditions, including aurora activity.

Check out the summer issue of *CQ VHF* magazine, especially the new "Propagation" column, for the latest look at propagation on the VHF and higher frequencies.

Don't take down those HF antennas yet, because there's a lot of DX still to be had. Look for me on the airwaves, especially in the evening hours. Also, please write to me with your questions or observations.

73, Tomas, NW7US/AAMØEWA

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *daylight* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

August 15 - September 15, 2003
Time Zone: EDT (24-Hour Time)
EASTERN USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-15 (1)	08-10 (1) 10-15 (2) 15-17 (1)	05-06 (1) 06-07 (2) 07-10 (3) 10-11 (2) 11-13 (1) 13-14 (2) 14-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-21 (1)	19-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 20-01 (1)* 21-00 (2)* 00-02 (1)*
Northern Europe & European CIS	09-13 (1)	08-09 (1) 09-14 (2) 14-16 (1)	05-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1)	19-21 (1) 21-00 (2) 00-02 (1) 20-21 (1)* 21-00 (2)* 00-01 (1)*
Eastern Mediterranean & Middle East	11-14 (1)	08-09 (1) 09-16 (2) 16-17 (1)	07-09 (2) 09-14 (1) 14-16 (2) 16-19 (3) 19-22 (2) 22-01 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Western Africa	11-14 (1) 14-16 (2) 16-17 (1)	07-09 (1) 09-14 (2) 14-17 (3) 17-18 (2) 18-19 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-23 (4) 23-02 (3) 02-06 (2) 06-09 (1)	20-23 (1) 23-02 (2) 02-03 (1) 21-02 (1)*
Eastern & Central Africa	13-16 (1)	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (2) 22-00 (1)	20-02 (1) 21-01 (1)*
Southern Africa	10-11 (1) 11-13 (2) 13-14 (1)	09-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-17 (2) 17-18 (1)	08-15 (1) 15-17 (2) 17-21 (3) 21-22 (2) 22-00 (1) 00-02 (2) 02-03 (1)	20-22 (1) 22-01 (2) 01-03 (1) 21-02 (1)*
Central & South Asia	*Nil*	09-12 (1) 20-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 19-20 (1) 20-22 (2) 22-00 (1)	05-07 (1) 19-21 (1)
Southeast Asia	*Nil*	08-10 (1) 10-12 (2) 12-14 (1) 18-19 (1) 19-21 (2) 21-22 (1)	06-08 (1) 08-10 (2) 10-11 (1) 19-22 (1) 22-00 (2) 00-01 (1)	*Nil*
Far East	*Nil*	09-11 (1) 18-20 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-13 (1) 18-20 (1) 20-22 (2) 22-00 (1)	05-06 (1) 06-07 (2) 07-08 (1) 06-07 (1)*
South Pacific & New Zealand	11-15 (1) 15-18 (2) 18-20 (1)	09-15 (1) 15-18 (2) 18-20 (3) 20-21 (2) 21-22 (1)	12-20 (1) 20-22 (2) 22-02 (3) 02-04 (2) 04-07 (1) 07-09 (2) 09-12 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-07 (2) 07-09 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Australasia	16-17 (1) 17-19 (2) 19-21 (1)	09-11 (1) 16-18 (1) 18-21 (2) 21-22 (!)	07-10 (2) 10-16 (1) 16-18 (2) 18-22 (1) 22-00 (2) 00-02 (1)	03-04 (1) 04-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-16 (3) 16-18 (2) 18-19 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-14 (4) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	07-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-18 (3) 18-20 (4) 20-02 (3) 02-04 (2) 04-06 (1)	19-20 (1) 20-21 (2) 21-03 (4) 03-05 (3) 05-06 (2) 06-08 (1) 20-00 (1)* 00-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-12 (1) 12-14 (2) 14-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-11 (2) 11-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-21 (1)	13-16 (1) 16-18 (2) 18-19 (3) 19-22 (4) 22-02 (3) 02-03 (2) 03-06 (1) 06-07 (2) 07-09 (3) 09-10 (2) 10-12 (1)	20-23 (1) 23-05 (2) 05-07 (1) 03-06 (1)*
McMurdo Sound, Antarctica	*Nil*	14-16 (1) 16-18 (2) 18-19 (1)	18-20 (1) 20-21 (2) 21-00 (3) 00-02 (2) 02-07 (1) 07-09 (2) 09-10 (1)	01-05 (1)

Time Zones: CDT & MDT
(24-Hour Time)
CENTRAL USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-14 (1)	09-11 (1) 11-14 (2) 14-16 (1)	05-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-00 (1)	19-22 (1) 22-01 (2) 01-02 (1) 22-01 (1)*
Northern & Central Europe & European CIS	08-12 (1)	11-16 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	19-20 (1) 20-00 (2) 00-01 (1) 20-00 (1)*
Eastern Mediterranean & Middle East	*Nil*	10-11 (1) 11-13 (2) 13-15 (1)	06-08 (1) 08-10 (2) 10-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-22 (1)	19-00 (1) 20-23 (1)*
Western Africa	10-12 (1) 12-16 (2) 16-17 (1)	07-10 (1) 10-13 (2) 13-17 (3) 17-19 (2) 19-20 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-00 (3) 00-01 (2) 01-08 (1)	20-23 (1) 23-01 (2) 01-02 (1) 21-00 (1)*
Eastern & Central Africa	13-15 (1)	11-13 (1) 13-17 (2) 17-18 (1)	13-15 (1) 15-17 (2) 17-22 (3) 22-00 (2) 00-02 (1)	20-00 (1) 21-23 (1)*
Southern Africa	11-13 (1)	08-10 (1) 10-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	06-09 (1) 13-15 (1) 15-18 (3) 18-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	19-21 (1) 21-00 (2) 00-01 (1) 21-00 (1)*
Central & South Asia	*Nil*	09-11 (1) 18-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-11 (1) 17-19 (1) 19-21 (2) 21-23 (1)	06-08 (1) 19-21 (1)
Southeast Asia	*Nil*	10-12 (1) 17-18 (1) 18-20 (2) 20-21 (1)	07-08 (1) 08-10 (2) 10-13 (1) 19-21 (1) 21-23 (2) 23-01 (1)	06-08 (1)
Far East	*Nil*	09-11 (1) 15-16 (1) 16-18 (2) 18-20 (1)	19-22 (1) 22-00 (2) 00-02 (1) 07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-15 (1)	03-06 (1) 06-07 (2) 07-08 (1) 05-07 (1)*
South Pacific & New Zealand	09-15 (1) 15-17 (2) 17-19 (3) 19-20 (1)	09-13 (1) 13-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	08-10 (3) 10-13 (2) 13-18 (1) 18-20 (2) 20-23 (3) 23-03 (4) 03-05 (3) 05-08 (2)	00-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1) 01-03 (1)* 03-06 (2)* 06-07 (1)*
Australasia	09-11 (1) 14-16 (1) 16-19 (2) 19-20 (1)	09-11 (1) 15-16 (1) 16-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	08-10 (3) 10-13 (2) 13-20 (1) 20-22 (2) 22-23 (3) 23-01 (4) 01-05 (3) 05-08 (2)	02-04 (1) 04-05 (2) 05-06 (3) 06-07 (2) 07-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	07-08 (1) 08-10 (2) 10-13 (3) 13-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	08-10 (4) 10-12 (3) 12-16 (2) 16-18 (3) 18-22 (4) 22-01 (3) 01-05 (2) 05-08 (3)	19-20 (1) 20-23 (2) 21-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 20-23 (1)* 23-05 (2)* 05-06 (1)*

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Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	12-16 (1) 16-17 (2) 17-19 (3) 19-22 (4) 22-02 (3) 02-04 (2) 04-07 (1) 07-09 (2) 09-10 (1)	20-22 (1) 22-05 (2) 05-07 (1) 02-05 (1)*
McMurdo Sound	*Nil*	13-15 (1) 15-17 (2) 17-20 (1)	17-19 (1) 19-21 (2) 21-01 (3) 01-03 (2) 03-07 (1) 07-09 (2) 09-10 (1)	01-06 (1)

Time Zone: PDT (24-Hour Time) WESTERN USA To:

Reception Area	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	*Nil*	09-11 (1) 11-13 (2) 13-15 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-13 (2) 13-14 (3) 14-15 (2) 15-18 (1) 22-23 (1) 23-01 (2) 01-02 (1)	20-21 (1) 21-23 (2) 23-00 (1) 22-23 (1)*
Central & Northern Europe & European CIS	*Nil*	09-11 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-17 (1) 22-00 (1)	18-20 (1) 20-22 (2) 22-23 (1) 21-22 (1)*
Eastern Mediter-ranean & Middle East	*Nil*	08-09 (1) 09-11 (2) 11-12 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-17 (1) 19-20 (1) 20-22 (2) 22-23 (1)	20-22 (1)
Western & Central Africa	13-16 (1)	08-11 (1) 11-13 (2) 13-15 (3) 15-17 (2) 17-18 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-00 (2) 00-07 (1) 07-09 (2) 09-10 (1)	21-00 (1)
Eastern Africa	*Nil*	09-13 (1) 13-16 (2) 16-18 (1)	13-15 (1) 15-18 (2) 18-19 (3) 19-21 (2) 21-22 (1)	20-22 (1)
Southern Africa	10-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-18 (3) 18-19 (2) 19-22 (1) 22-23 (3) 23-00 (1)	19-20 (1) 20-22 (2) 22-23 (1) 20-22 (1)*
Central & South Asia	*Nil*	09-11 (1) 17-19 (1) 19-21 (2) 21-22 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-20 (1) 20-22 (2) 22-23 (1)	06-08 (1)
Southeast Asia	16-19 (1)	09-11 (1) 15-17 (1) 17-20 (2) 20-21 (1)	21-01 (1) 01-03 (2) 03-04 (3) 04-07 (2) 07-09 (3) 09-10 (2) 10-12 (1) 19-21 (1)	03-07 (1)
Far East	15-18 (1)	09-11 (1) 14-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	21-23 (2) 23-01 (3) 01-02 (2) 02-07 (1) 07-08 (2) 08-10 (4) 10-11 (3) 11-12 (2) 12-14 (1)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (1) 02-05 (1)* 05-06 (2)* 06-07 (1)*
South Pacific & New Zealand	09-15 (1) 15-16 (2) 16-19 (3) 19-20 (2) 20-21 (1)	09-13 (1) 13-17 (2) 17-18 (3) 18-20 (4) 20-21 (3) 21-22 (2) 22-20 (1)	05-09 (2) 09-11 (3) 11-13 (2) 13-17 (1) 17-19 (2) 19-22 (3) 22-01 (4) 01-05 (3)	22-23 (1) 23-04 (3) 04-06 (4) 06-07 (3) 07-08 (1) 23-01 (1)* 01-03 (2)* 03-05 (3)* 05-06 (2)* 06-07 (1)*
Austral-Asia	09-14 (1) 14-18 (2) 18-20 (1)	09-11 (1) 14-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-00 (1)	13-20 (1) 20-22 (2) 22-23 (3) 23-02 (4) 02-05 (3) 05-08 (2) 08-10 (3) 10-13 (2)	01-02 (1) 02-03 (2) 03-06 (3) 06-07 (2) 07-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central, America & Northern Countries of South America	09-11 (1) 11-16 (2) 16-17 (1)	07-08 (1) 08-10 (3) 10-12 (2) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-20 (4) 20-00 (3) 00-05 (2) 05-06 (3)	19-20 (1) 20-21 (3) 21-04 (4) 04-05 (2) 05-06 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-15 (3) 15-16 (2) 16-18 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	13-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-00 (2) 00-07 (1) 07-09 (2) 09-11 (1)	20-23 (1) 23-04 (2) 04-05 (1) 00-04 (1)*
McMurdo Sound, Antarctica	*Nil*	13-17 (1) 17-19 (2) 19-21 (1)	09-11 (1) 17-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-04 (1)	23-03 (1) 03-05 (2) 05-07 (1)

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.

Propagation charts prepared by George Jacobs, W3ASK.

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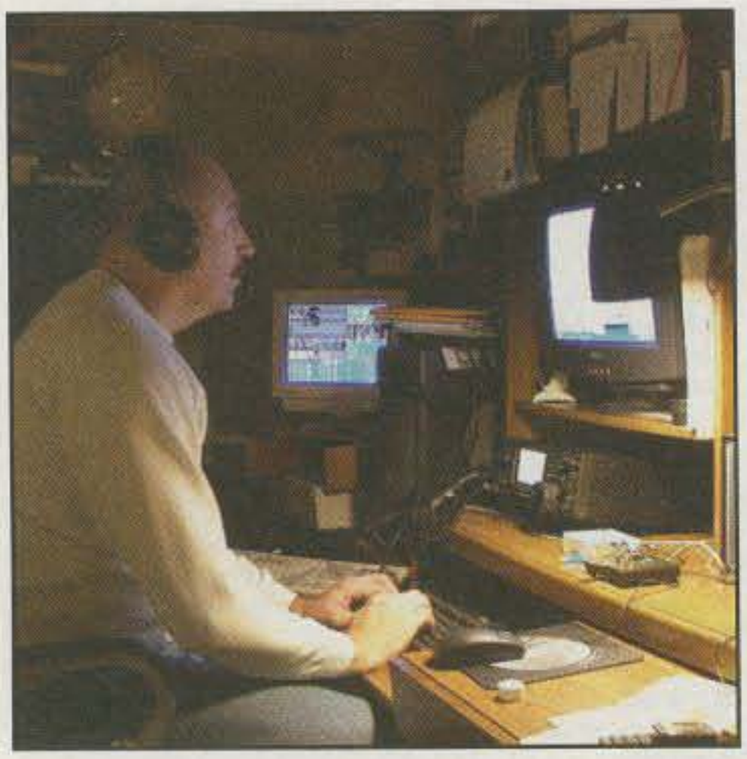

KB9KEG contesting at 1 AM local time.

Asia: 4X/NP3D (A3.7), RK9CWW (M2), A61AJ (MM)

Europe: HA8BE (L1.8), GI5W (AA), RW2F (M2)

Oceania: ZL3GA (A28), KHØAA (MS), AH2R (M2)

South America: PJ4/OH1VR (L28), LU4HMF (Q14), LU3DR (Q21), P40P (AA), PY2WC (A14), L21I (A21), PJ2T (M2)

Comments

The number of logs received for the SSB contest was the second highest number in 55 years! There were over 4100 logs representing 3.6 million log entries and 234 countries. It doesn`t take too much gray matter to realize that if you want to have fun, work new countries, and meet thousands of contesters on the air, the place to be is the CQ WW. The CQ WW Contest Committee wants to thank you, the valued entrants, for submitting your SSB logs via the internet and in Cabrillo format. All SSB logs were in electronic format! The contest is made much better by your submission, no matter how small.

The Cabrillo format is provided by all the popular contesting programs. Now that CT is available free on the internet, even more people will find it easy to submit their logs in Cabrillo format. Remember to send your SSB log to: **<ssb@cqww.com>**. You will receive a response from our robot telling you that all is okay or an error message that will guide you to make the required corrections. The messages are in many languages and DX members of the CQ WW Contest Committee stand ready to assist with any questions. You can also submit photos via the internet. How to do it can be found at <www.cqww.com>. We will post all the received photos on that site.

Packet is available as a tool in all the Multi categories and the Assisted category. It is ***not*** available as a tool in any other category. The ***only*** Single Operator category that allows packet or ***any*** spotting assistance is the Assisted category. There are two general misuses of packet. The first is self-spotting. This misuse applies to ***any*** category, including Assisted. You cannot use any means to solicit QSOs on the packet/the internet. The rules are clear on this subject. The second is using any DX spotting means (i.e., packet) to find QSOs. This is okay for all the Multi and Assisted categories. The misuse occurs when an entrant does ***not*** claim packet but ***uses*** packet. There can be several reasons for mistakenly not claiming packet: You forgot to claim the correct category; you just submitted your log without worrying; you were not familiar with the rules.

Over the last several years the CQ WW Contest Committee has developed software that allows the detection of packet use. Thanks to the cooperation of all the major packet services, we were able to create a massive file of all packet call-outs during the CQ WW SSB test. This year we checked all 4100 SSB logs against this packet file. The results are very heartening. Only 12 logs were reclassified. Since the CQ WW is the first contest to analyze logs in this manner, we have had to develop some ways to deal with packet misuse. The first step is a letter of inquiry asking the entrant if he used packet and forgot to indicate the proper category in the summary information. This usually solves the problem, being that most misclassifications are human errors of ommision. After a second year of not claiming the use of packet, a warning letter is sent. Thereafter, the entrant's log will become a checklog. First and second violations lead to proper classification as Assisted. Third violations cause the logs to become checklogs. It is easy to avoid any problems: Claim the category you actually entered. It is that simple.

Thanks

Thanks to all the CQ WW Contest Committee members who validated the winners and provided insight into many contesting topics. The 2002 crew included K1DG, K3WW, K3ZO, KR2Q, N2AA, N2NC, N3ED, N6ZZ, N9RV, WØUN, W3ZZ, K1AR, KM3T, KT3Y, N5TJ, N5NJ, K6NA, and N8BJQ. Our DX advisors, who were very helpful in offering advice, providing information, and sorting out potential problems, were CT1BOH, DL6RAI, DJ6QT, EA3DU, F6BEE, G3SXW, I2UIY, E21EIC, JE1CKA, OH2KI, OH2MM, OK2FD, PY5EG, S50A, UA9BA, VA7RR, VE3EJ, and RA3AUU.

A special thanks to Dick, N6AA, who once again spent countless hours to make the CQ WW database the best in contesting. Phil, N6ZZ, spent many hours helping N6AA to make sure the database was as clean as possible. The CQ WW uses the software developed by Tree, N6TR, to create the database. This year John, K2MM, has moved on to other pursuits. The CQ WW Contest Committee wishes to thank him for his invaluable assistance over many years. The Cabrillo robot was designed and/or managed by N5KO, N6TR, and N6TW. Entrant Cabrillo compliance help was provided by N6TW and N5KO with the assistance of most of the committee listed above. The WT4I software provided invaluable assistance with specialized log checking.

Translations of the rules/Cabrillo robot responses into Spanish (EA3DU), Japanese (JE1CKA), German (DL6RAI), Slovenian (S50A), Serbian (S50A), Russian (UA9BA), Finnish (OH2KI), Turkish (TA3J), and French (F6BEE) made life a little easier for non-English-speaking contesters. Larry, N6TW, was invaluable in retrieving and processing data from e-mail submissions. Thanks to John, K1AR, for his advice and hard work to make the CQ WW so successful.

Congratulations to all the winners! Try to get a fellow contester on for a local, friendly competition. To educate, participate, and have *fun* is what contesting is all about!

73 and CU in the 2003 contest. . .

Bob, K3EST

DX QRM

The aurora cut me off from the world for a while. However, an improvement was noticeable from around 7Z when 40 gave me some North American stations. . . . **7S2E.** Four new contesters were initiated during this contest. Special thanks to Harriet, 8P6GI's XYL, who kept us watered and fed all weekend. . . . **8P2K.** Enjoyed hearing "thanks for the double mult" many times. Still had fun as always. . . . **9M6A.** I tried QRP section for a first time. I always thought there is no way that I could make any contact with a simple antenna. I have used FT817 (5 watts) and R7000 vertical. I admire fellows making K QSOs using this mode. Next year probably as VK6DXI. . . . **9V1XE.** First HF contest. Absolutely fabulous to be swimming in so many DX contacts around the clock from all over the globe! Got 22 new countries, including A61AJ with 100W IC-706 MKIIG to a Hustler mobile antenna on an Alpha Delta outreach outpost tripod! . . . **AH6RH.** The flu did not stop me from enjoying the contest. . . . **BD8TG.** Great ears at HC8A, 9S1X, and FS/AH8DX. . . . **CE4U.** Aurora, aurora would you please come out to play when it is not a contest weekend! . . . **CK6SV.** We all had a fantastic weekend and learned a lot! . . . **CS6RPA.** That's my first try from my new contest stn in D4. Thanks to EY8MM, EY8CQ, who helped me to build this station. . . . . **D4B (4L5A).** Boy what a contest! We had a storm warning in Germany and had winds up to 120 mph (180 km/h)! Never mind the score, it was fun! . . . **DF7ZS.** A heavy storm bent the Gap Titan over the beam. Subsequently the beam could be turned from 120 deg to 240 deg only. Anyhow, a lot of fun. . . . **DL8AAE.** More than 20 hours over 100 QSO/h in monoband. . . . **EA3QP.** Operated from a hilltop location, 948m high and 15km from the Mediterranean coast. I had to work a whole lot harder this year to get a similar score to last. Worked 8N1OGA for #261 from the mobile. Loved it! . . . **EA5ON.** We remembered all the other contesters when we were having dinner on Saturday afternoon eating a special typical meal by EA2MQ. Our special thanks to EA2ANW and his wife who lent us the place for the antenna. . . . **ED2WWW.** Our first CQ WW DX Contest. We enjoyed the party very much. Thanks to everybody who made a contact with us. . . . **EW8ZZ.**

Best effort from zone 8 with an all-band Butternut vertical. . . . **FS/AH8DX.** After an hour without electricity I decided to move station to a nearby house where there was still power. Got back on the air by 10:00 with a vertical antenna but made a total of only 5 Qs when the power went off there too. . . . **GØAEV.** My first contest and had a fantastic time and plan to indulge further in contesting. . . . **GØVXE.** For a QRP station max 5 watts o/p with simple aerials together with an age handicap of 80 years! I still found it a challenging and rewarding contest. . . . **G3FNM.** High winds were forecast and we had a 76 mph gust, then the power went off. Power was restored two hours later. Some parts of the country had no power for six days. . . . **G4BUO.** Much better propagation than from my home QTH in N. Scotland. As usual, the best SSB contest of the year! . . . **GD6IA.** Running barefoot as amp was broken. Beam swinging wildly in force 8 gales. . . . **GJØNYG.** Our first multi-multi effort as a group and great fun was had by all! It was generally agreed that our report card should read "a good effort but could do better." Roll on next year! . . . **GM5A.** My first SOAB from home in this event. It will be very hard to consider a single band entry ever again! . . . **GM7V.** Weather forecast was for severe gales so I lowered tower to 25 ft. before dark on Saturday. Hitting 73 soon, so bit tired! Five hours of power cuts and tree blown down—exciting, eh? . . . **GW3JXN.** The southern UK was hit by storm-force winds reaching 100 mph in parts. Here I use a crank-up tower, so was fortunate to be able to lower it during late Saturday evening before the storm reached us. . . . **GW4BLE.**

It was really fun. . . . **HLØCAC.** First contest from SE Asia. A big difference from other countries I have operated from (TJ1AW, T5CT, SVØCT, G5BAU, GC5BAU, K4PHY/YV5. A lot of fun as always! . . . **HSØZDR.** Beautiful way to experience wonderful teamwork. We've just landed on contest planet. . . . **I3GWE.** The Field Day location on Lampedusa Island doesn't permit rest because you always have to work before and after the contest for building and dismantling all antennas. . . . **IG9A.** First effort from a 3-point land (IG9). A lot of work to do since it was a real DXpedition. Nothing was there when we arrived and nothing was up Monday after the contest. . . . **IG9V.** First attempt to build a M/S contest station in Sicily. It will be a school for new contesters. Thanks to Fabio, IT9GSF, for his help. . . . **IR9U.** A great contest. We want to thank Manos, SV9ALJ, and all the OMs in Crete for their great help and hospitality. . . . **J49Z.** Enjoyed Multi-Two category. More efficient than multi-multi, hi. . . . **JA6ZPR.** I QRV on 80m single band. Japanese 75m phone band is

very narrow, so I could not call CQ because of many Japanese station's QRM. I desire many USA stations to call CQ outside of JA band and QSX JA band. . . . **JE1SPY.** I used only hand-made wire antennas However, the conditions were not good comparing the last year I enjoyed a lot in high bands. . . . **JF3KQA/1.** This is my first contest. . . . **JT1CN.** Eight of us came together to share the weekend with KL7Y for his last contest of this world, in a place that he loved to be. None of us, nor our sport, will ever be the same without him. Vaya con dios, Danno. . . . **KH7R (KH6ND).** Our goal was to improve over last year, but soon realized it would be very difficult because of aurora the first day. Anyway, great fun with lots of excellent operators. . . . **LA2Z.** It was nice to kick LY9A's ass! . . . **LY7Z.** My first attempt and great fun. I was delighted to find such a high standard of operating. . . . **MØAFZ.** First time entry in this contest. . . . **MØDDT.** Even with just 100W, the antenna damaged (my signals must have been down by about 10–15 dB), and no way to turn it, I managed to work a surprising amount of good DX. Monday morning was glorious. I took from 7 AM to 2 PM to tear down the station in a post-contest euphoric afterglow state of mind. . . . **M4R.** Heavy storm with more than 90 miles/hr! We had to repair all antennas over and over. On the way back home a truck crashed into the trailer and now I need a new car, a new trailer, and a new contest station. Anyway, a great weekend. . . . **MJ/DL1EK.** Fun ended Sunday morning when the antenna was blown down. You have to be mad to do SOSB on 40m! . . . **MW5HOC.** Good time, our plan, work very fine. The new antennas in OA4O work excellent. . . . **OA4O.** Finally we are on the air again. . . . **OE2S.** Thanks to Multi-2 we had fun on the second station. The low bands have been great! . . . . **OE5T.**

One highlight of the contest was when I heard one Italian operator (I cannot remember the call) on 40m calling his version of CQ by singing it in a funny way. Yes, he really was singing! . . . **OH6NIO.** Big surprise was 21 (!!) VU stations. . . . **OK1RI.** Started on 15m, but I lost my 15m quad the second morning in the biggest storm in the last decade. Had to limit my effort to 20m single band. . . . **ON4APU.** Loved every minute of this great contest. Super FB conditions on 15m on Sunday. . . . **ON6CQ.** Contesting is fun! . . . **OT2H.** Funny thing. Sunday at 1154 UTC W2AX logged me as OZ8AE and asked for another OZ station. This was OZ8EA, but we could confirm that it was okay—hi. . . . **OZ8AE.** When I set up my station my transceiver didn't work. I had to borrow a non-contest radio from a local, to whom I am very grateful. Murphy still wasn't finished. During a band peak I had a rare power failure, causing many missed QSOs. My second week in Aruba went well and I got married there. I was saddened to hear that this was KL7Y's last contest. He will be missed. . . . **P40A.** Very good conditions. 10 m on Saturday wide open. Worked USA on 80 and 40 m (split frequency) for the first time in my ham life! (27 years). . . . **PAØLSK.** Wind speed most times higher than QSO rate. The rain passed only horizontal. . . . **PA7MM.** Great band conditions but awful weather conditions with winds reaching 140 km in the Hague! Another good reason to stay indoors and play radio! . . .**PA9ZZ.** The best of the best contests. . . . **PY3MM.** Two auroras during contest. It's too much for good result. . . . **RU1A.** We are all 15 years old. . . . **RZ9SWP.** This time I tried to operate on 40 meters and it was tough! I had been warned by Carlos, SM5KCO (ex-SMØKCO a.s.a CX7CO), but I needed some new countries for the 5B DXCC. I have *sisu,* due to Finnish origin. . . . **SM5C (SM5SIC).** Another nice contest. When finished I felt it worth the effort. . . . **SV1DKR.** Next year more countries/zones/contacts than this year. . . . **TA1BM.** Having visible northern lights three nights in a row doesn't help the conditions. Nice to get so many thanks from many stn. just for being on the air. . . . **TF3IRA.**

Wow, good conditions. DXCC will be okay just after 7 hours run and mults operation on 15 m. . . . **TM7XX.** Conditions were not so good (especially on 10m) as last year. My first CQ WW phone was in the year 1956 as UA1KBB. . . . **U1BA.** I worked this contest on the E-H antenna (two cylinders, 50 mm diameter, and 150 mm length plus matching box near the transceiver). Has anybody done it before? Sorry, but had no more than 18 hours for the contest. . . . **UT4EK.** The KD3TB and KD3RF team joined by K3FMQ this year ran a Field Day type operation from a motel room in rural Canada bringing up all antennas, radios, and equipment by car. . . . **VE2/KD3RF.** On 80m it was a thrill to hear VK6LK long path and JF1IST, both with good signals. A delight to work them. . . . **VE2ZP.** Some said, "You are mobile! Just unbelievable." . . . **VE3EDY.** CQ WW contests are loads of fun. You never know who is going to call you! . . . **VE3JAQ.** Nice to hear old friends I have met in over 50 years of contesting. Hope to be back again next year health permitting. . . . **VE4IM.** We were quite satisfied with our results, and as always, tons of fun, jokes, beer, and operating time. . . . **VE5RI.** We like the M2 category. Joseph, VE6PYJ, at 16 enjoyed the runs on 10 meters. He is becoming a steady operator. . . . **VE6FI.** Great fun with the new M2 class. We vote for it for next year! . . . **VK1JDX.** Really enjoyed breaking the Low Power record in VK. Sunday was very poor with very bad propagation. Saturday morning was fantastic. . . . **VK3TZ.** QRPp is a great challenge but frustrating at times. I was happy with my results. Thanks for the event. . . . **VK3VP.** Thank you for another great contest. Local storms provided a challenge for me. It unfortunately closed me down when propagation was good at times, but I would never miss the CQ WW. . . . **VK4EJ.**

First time we participated in this contest from a DX site. Enjoyed it a lot. Never expected that the pile-ups were so big during the total 48 hours. . . . **VP2MPA.** My first attempt in CQ WW. . . . **VU2SWS.** Enjoyed the contest, poor band conditions, TRX homemade. . . . **VU3DJQ.** Very poor propagation; every contact was "worked"! . . . **VY1JA.** Bands were not in good shape for this contest. I called and called and could not get anything going. Don't forget we are here. Point those beams north. I had fun anyway. . . . **VY1MB.** Goal: make 100 countries and 300 QSOs—did 500! Good conditions and happy to be multiplier to so many. Saludos from Puerto Rico . . . . **WP3GW.** Highlight: calls from EA6DD, IH9P, A45XR, etc. Lowlight: the rotator didn't work, sore throat, and no QSO with zone 26! . . . **XU7ACD.** My transceiver is Yaesu-920. Max power in the contest is 100W. My antenna is R5 about 20m high above the ground. . . . **XX9AU.** The best run of WW SSB Contest of my lifetime! . . . **YB2LAB.** My first CQ WW DX Contest, and yes, done with a barefoot FT-920 (100W) and a vertical antenna. . . . **YO5CRQ.** On Saturday was called at work for 4 hours; on Sunday few hours without electricity. Also was forced to QRT when my 6-month-old son was sleeping. My 6-year-old daughter forced me few hours to walk together in the park. My wife asked me for a lunch in the restaurant. Nobody copied my callsign at first call. On the end only 768 QSOs in my log. . . . **ZA/Z35M.** ZK1JD's first contest. Let him close the contest. Did anyone get the suffix for 8P8P or 9A9A (hi hi). . . . **ZK1CG.** Many thanks to the people of the Tauhunu village who helped make this a great sucess for Western Washington DX Club. . . . **ZK1MA.** The new Multi-2 category is a lot more fun than Multi-Single! . . . **ZL6QH.** My first CQ WW DX phone contest! . . . **ZS4MS.**

USA QRM

We greatly enjoyed the new Multi-2 category. Thanks CQ! . . . **AA5NT.** Our first Multi-2 in any contest. I really like the category. . . . **KØTV/1.** My first contest since upgrade to General. My dad, K1RC, talked me into it. Now I'm hooked on contesting. . . . **K1CGJ.** My first CQ WW. . . . **K2EL.** All QSOs S&P. Ten meters was excellent both days with new multipliers flowing in til the end of the contest. . . . **K2FU.** Worked two new countries. A big thanks to the people who travel to foreign countries to give us low power guys a chance to work more DX! . . . **K2HT/Ø.** After 35 years of paper/pencil contesting, this was the first time I used computer logging. It's great! . . . **K2MFY.** The best part of the contest? Meeting so many good friends on the air. A special thanks to Gene, N2AA, at A61AJ for taking the time from the pile-up to chat for a few minutes. I wish I could have been there again with all of you. Maybe in 2003! . . . **K2RED.** Wow! . . . **K4BEV.** Spent some time listening to FS/AH8DX running them—truly amazing. . . . **K4FK (W4SAA).** First contest. Enjoyed working all the DX stations that I did. . . . **K4JHK.** It doesn't get much better than this! I enjoyed every minute and many thanks to everyone who made a contact with me! . . . **K4WI.** I enjoy all the good contest operators and try to give out a few points. . . . **K4XG.** First contest. Enjoyed my limited operating time. I'll do it again! . . . **K5JFG.** Operated with 100 watts to an MFJ-1786 loop antenna disguised as a TV antenna. . . . **K6ACZ.** Greatest contest, first time entry. TNX. . . . **K6CA.** Our first multi-op attempt; wait til next year! Great comaraderie with like-minded contesters. . . . **K7ZSD.** I am convinced, no radio waves below 7 MHz reach this area of the planet. . . . **K8FC/Ø.** Great contest, great conditions! This one was loads of fun! . . . **K8FK/4.** All was going well until the elk took down my 75 and 160m inverted-Vees early Saturday evening! . . . **K9MWM/Ø.** Thanks to those good ears that can hear 50 watts into a dipole in the garage. . . . **K9OSH.**

First time as Multi-2. Lots of fun mixed with a little stray RF. Worked several new countries. . . . **KA6BIM.** My first CQ WW contest. I have a few new countries in my collection now. . . . **KB1GHC.** First HF contest. . . . **KB3FCS.** Surprised by all the activity on the bands. Got a few new countries and met a few old friends; that is what ham radio is about. . . . **KB9KEG.** CQ WW is still the best contest in the whole wide world. . . . **KC1XX.** Great condx on 10m! Stations from 28.3 to 29.0! . . . **KC6X.** First serious attempt at a contest; had lots of fun! . . . **KC8RAN.** First QSOs ever on 40 meters. I like this band. My first CQ WW contest. . . . **KD7IIC.** A lot of fun running the contest with my sons. We had a blast! . . . **KD9ST.** The CQ WW—always a thrill to compete! All contacts S&P. . . . **KF8K.** I love this contest. . . . **KG6NDO.** Many thanks to all who dug me and my 40m dipole out of the mud. . . . **KG8ZD.** Lots of fun after an almost ten year absence! . . . **KK4RV.** Great time with the new 3-element Fluid Motion Steppir antenna. The ability to change the direction of the beam 180 degrees almost instantly or to use it in bi-directional mode from here in Florida a great plus. . . . **KK4TA.** All who participated had a blast. Our first contest at our new club house, also first contest as KK5K. . . . **KK5K.** Try QRP for some real fun! . . . **KQ4YY.** Say, can we get astronauts to participate in this contest? Since my signals were going through the holes in the ionosphere and not received by many stations here on Earth, they could have been copied in deep space! . . . **KS7T.** Mediocre conditions, great DX participation, fantastic fun. . . . **KT1V.** It would be real nice to see a "triband only" category. . . . **N1API.** I hope everyone had as much fun as I did. I am already looking forward to doing it again next year! . . . **N1BCL.** Although conditions down from last year, my score was up 10% due to all the activity. Thanks, guys. . . . **N1DG.** My personal best operating this contest Single Op Assisted even though I participated on the high bands only. One of the most fun CQ WW contests I have operated save when operating as a multi-op station! . . . **N1MD.**

First CQ WW and only worked 40m. What a zoo! Lots of big guns, but timing is everything. Pretty happy with results. . . . **N2KX.** My first "big" effort in CQ WW. I put up a multi-band dipole which helped a lot. I am already planning antenna changes for next year! . . . **N3GNW.** Had a great time in our first ever Multi-2 effort. Conditions were spotty at times, but we kept the stations manned full-time and gutted out some slow hours. It was great having Walt with us once again. . . . **N3RS.** The declining conditions caused my score to go up this year. I had no choice but to S&P. I had 54 more band countries and 20 more band zones using the same station and the same amount of operating time. . . . **N4TZ/9.** Not many replies to my low power CQs but TT8ZZ made them worthwhile! . . . **N5AW.** Great band conditions on 10m! Tuning VFO entire contest. Thanks to Bob, NX5M, for use of his impressive station. . . . **N5XJ.** Conditions were strange due to the solar activity. Europeans on 15m had very heavy auroral sound and we W6's could only work some Europeans on 10m sidescatter. Lots of fun, thanks to good JA operators. . . . **N6BV.** Fun all around and yes West Virginia is in zone 5. . . . **N8EMS.** Very challenging contest with only 5W using an FT-817. . . . **N8VGY.** With a little help from Lou Gehrig's spirit I was able to see this one through. While certainly not in contention, I was at least in the race. I can't help but wonder how many other physically challanged contesters are out there? . . . **N9LCR.** Had a blast! Only had a few hours to operate, but even with my little station I managed to work 69 countries and 24 zones! . . . **N9RLA.** First shakedown for all bands for this station. The supply of multipliers was endless. Have to operate for a week to try to get them all. . . . **N9RV.** First time ever using more than 100 watts. I think I like it! . . . **N9SE.** I'm a new ham and this was my first contest. Wonderful! . . . **NE1RD.** All ops seemed to be much more courteous this year. Most actually waited when specific call requests were made in a pile-up. . . . **NE4S.** Not only my first contest after a 10-year absence, but an all-time personal best! . . . **NG1J.** The whole event was a lot of fun from the very first contact to the last one just before time ran out. . . . **NK7C.**

Many thanks to many operator efforts to get my unusual prefix correct. . . . **NZ3O.** Wow, lots of activity! Great fun! . . .**WØRSR.** CQ WW = still the greatest! . . . **W1ZK.** Worked three all-time new countries—N. Cook Is., Congo, and Niger—so I'm happy! . . . **W2VU.** Our first effort at KG4NEP. We built a five tower station in six weeks. To re-use an old phrase by Roger Burt, N4ZC, this place is a champagne station on a beer budget (really cheap beer). Storage shed turned into a three-position M/S operating shack. Sure had fun! . . . **W4WS.** Thanks to the committee for the new category. It was a real blast. . . . **W6KK.** Terrific propagation! Ten meters was fantastic for the entire contest. I missed the West Coast-to-Europe opening Saturday morning and still managed to work 24 zones on 10m running 5W QRP. When the solar conditions are alive and well, there are no meters like 10 meters! . . . **W6RCL.** Wow! What a hoot! . . . **W7GTM.** Working Western Sahara, Senegal, the Galapagos Islands, and Guam was exciting, but the big thrill was Hawaii on 40 meters. . . . **W8KNO.** Conditions seemed to improve as contest went on. Sunday 10m was good. Unfortunately I was on 15! . . . **W9RE.** Was my first entry in a contest. I never thought that QRP could be so tough, but I enjoyed it. . . . **W9RPM.** Beam stuck on NE all weekend. Anyone in Asia Pacific who heard me has good ears. . . . **WA5SOG.** My most favorite contest, even though I don't get to spend as much time as I like in front of the radio. . . . **WB3CJU.** 44 unique countries worked. Insulated wire stealth antenna up 40 feet in heavy foliage trees next to I-75 in downtown Atlanta industrial area. . . . **WB6BWZ/4.** Our club's first CQ WW DX Contest. We had a blast! . . . **WC8VOA.** Glad to see so many stations listening up on 40. Will be nice when broadcast stations go away in few years. . . . **WQ2M.** My very first participation in a contest and I enjoyed it immensely. Operated on only three bands and for a total of 12 hours. . . . **WR9A.**

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zones, and Countries. An asterisk (*) before a call indicates low power. Certificate winners are listed in bold. (All country terminology reflects the DXCC list at the time of the contest.)

SSB RESULTS

SINGLE OPERATOR

NORTH AMERICA

UNITED STATES

KQ2M/1	**A**	**7,152,781**	**3824**	**158**	**581**
K5ZD/1	**"**	**5,280,044**	**2759**	**148**	**534**
W1WEF	**"**	**3,291,504**	**2248**	**125**	**439**
KC1F	*	2,495,190	1919	104	361
K5MA/1	*	2,297,312	1574	123	421
W1RZF	*	1,550,958	1419	99	339
N1DD	*	1,543,960	1211	112	372
K3NA/1	*	1,495,392	1312	97	347
KE1IH	*	1,487,504	1163	106	390
W1ZK	*	1,474,578	1130	116	382
AK1N	*	1,350,387	1150	112	335
W1OP	*	1,254,456	1015	102	354
K1GU	*	1,169,376	1031	100	316
W1NT	*	1,026,432	921	95	337
W1KRS	*	779,076	706	87	315
KG1E	*	754,450	783	93	289
N1BCL	*	673,365	724	95	276
N7NG/1	*	568,170	624	81	273
W1MK	*	553,219	644	91	268
NQ1K	*	509,120	544	91	253
K1BD	*	499,226	551	89	249
K1NOK	*	403,641	607	74	227
W1RWB	*	341,334	520	73	221
N1JW	*	318,936	431	77	214
K1ZZ	*	287,812	392	71	195
KV1J	*	243,840	390	62	178
KA1VMG	*	126,684	272	55	149
K1YA	*	120,015	261	59	130
N1XXU	*	70,334	196	40	99
KG1D	*	12,540	84	14	43
W1AW	14	1,518	24	5	17
				(Op: KH6HU)	
W1AD	**7**	**26,394**	**124**	**18**	**65**
KT1V	**3.7**	**144,584**	**513**	**21**	**85**
AA1BU	*	131,712	462	22	90
***N1SV**	**A**	**1,815,696**	**1458**	**106**	**380**
***W1CTN**	**"**	**1,406,529**	**1135**	**116**	**377**
***K1HT**	**"**	**1,221,090**	**953**	**106**	**359**
***WS1A**	**"**	**1,219,910**	**1045**	**97**	**333**
*W1KT	*	1,212,848	939	110	366
*W1TE	*	1,146,668	973	99	340
*WA1Z	*	869,616	830	94	302
*N1LW	*	743,870	737	84	281
*N3KCJ/1	*	686,511	722	83	274
*KX1X	*	623,040	758	77	243
*W1DAD	*	599,784	606	93	280
*W1ZS	*	557,286	657	73	244
*N4XR/1	*	417,391	540	88	243
*W1EQ	*	417,268	544	77	215
*W1VET	*	372,408	843	74	280
*N1DC	*	287,646	446	60	191
*W1JQ	*	251,760	406	66	174
*NG1J	*	184,386	308	62	175
*W1TW	*	168,225	320	67	166
*K1VSJ	*	143,420	283	63	139
*NE1RD	*	119,568	267	48	140
*N1HTS	*	104,130	228	51	127
*AA1UT	*	98,439	248	42	115
*K1CGJ	*	81,624	220	42	110
*K1RB	*	71,995	159	60	127
*KY1B	*	71,118	208	44	118
*W1AAD	*	48,128	159	39	89
*KB1LN	*	34,465	128	34	79
*W1LZ	*	33,600	121	28	77
*KB1GHC	*	29,592	114	35	73
*AE1T	*	27,391	119	33	58
*K1VU	*	22,042	117	37	66
*KB1GW	*	13,300	81	25	45
*K1UG	*	7,684	59	26	42
*NX1C	*	3,528	58	25	47
*N1VI	*	1,824	31	12	20
*K1MOM	*	1,140	20	14	16
*NJ1Q	*	624	17	11	15
*N4QX/1	*	150	6	4	6
***W1AIR**	**28**	**84,224**	**337**	**26**	**86**
*KA1ZEX	*	64,964	257	24	85
*W1GOU	*	29,876	147	15	62
*W1PLK	*	2,805	47	9	24
***W1EL**	**21**	**141,372**	**380**	**27**	**105**
*WA1FCN	*	101,556	308	27	99
*W1MJ	*	3,920	47	12	26
***KG1V**	**14**	**38,315**	**154**	**24**	**73**
N2LT	**A**	**2,331,072**	**1652**	**116**	**397**
N2MR	**"**	**1,239,916**	**1061**	**95**	**333**
K2FU	*	956,154	873	104	334
W2OO	*	940,386	856	105	333
W2LU	*	879,060	874	116	339
W2LE	*	512,928	616	72	240
WB2KLD	*	508,610	574	94	268
N2GC	*	486,147	532	80	267
W2UDT	*	379,115	506	87	218
WB2HJV	*	314,424	466	72	192
N2SQW	*	308,550	429	74	201
WR2V	*	220,834	424	48	170
K2NV	*	168,237	321	57	144
W2DXA	*	63,788	189	38	110
N2VM	*	17,848	94	38	59
WA2BKN	*	14,664	84	36	58
N2IHN	*	792	18	9	15
NA2X	**21**	**74,784**	**238**	**25**	**98**
KD2N	*	18,460	104	17	54
WQ2M	**7**	**79,918**	**272**	**28**	**94**
W2VO	**1.8**	**1,736**	**40**	**8**	**20**
***WB2ZTH**	**A**	**1,286,168**	**815**	**133**	**463**
***W2RDS**	**"**	**1,159,434**	**1006**	**94**	**327**
*K2CS	*	937,714	876	104	293
*K2SZ	*	643,808	741	83	258
*KV2M	*	586,090	792	76	214
*KC2DTJ	*	349,232	451	76	223
*N2MUN	*	305,067	525	50	169
*W2IRT	*	285,175	421	65	210
*WB2OQQ	*	284,986	509	54	172
*W2TZ	*	242,780	370	61	183
*N2NI	*	213,106	343	67	187
*K2PH	*	181,034	343	50	143
*K2TV	*	143,289	296	43	140
*AA2TM	*	140,275	304	44	137
*KB2M	*	138,245	300	64	151
*WW2P	*	121,346	303	43	123
*N2MTG	*	120,805	287	58	127
*WA2IAU	*	106,505	247	49	130
*K2YLH	*	100,367	286	47	120
*N2BZP	*	76,050	232	48	121
*N2CK	*	74,060	206	42	98
*KV2X	*	70,119	206	47	112
*K2YSY	*	66,566	176	50	116
*W2QOB	*	38,755	131	31	84
*N2DUB	*	25,767	94	28	79
*WB2HWI	*	16,352	109	20	53
*W2PI	*	16,200	89	25	56
*N2GA	*	11,748	68	17	49
*N2VR	*	6,832	52	15	41
*N2LQQ	*	882	20	7	14
*K2EL	*	247	15	8	11
***K2MFY**	**28**	**270,907**	**599**	**31**	**138**
*WB2DVU	*	140,589	404	25	102
*N2CU	*	95,418	298	23	91
*KS2G	*	70,952	270	21	77
*W3EH/2	*	11,651	101	16	45
*N2YXA	*	9,672	99	13	49
*K2SWZ	*	2,958	42	13	21
***W2WC**	**21**	**139,320**	**404**	**28**	**107**
*W2VU	*	40,656	172	20	68
*W2CVW	*	17,085	93	15	52
***K2RED**	**14**	**75,936**	**260**	**25**	**87**
***KA2JEM**	**"**	**75,438**	**249**	**30**	**97**
*KX2S	*	49,920	192	22	82
***K2UF**	**7**	**25,315**	**125**	**19**	**64**
*N2KX	*	21,951	111	19	62
*K2YEH	*	19,295	98	22	63
***W2MF**	**1.8**	**1,856**	**65**	**11**	**21**
K3ZO	**A**	**5,276,637**	**3098**	**136**	**485**
W3BGN	**"**	**4,155,347**	**2506**	**144**	**475**
K3CR	**"**	**3,847,584**	**2306**	**138**	**486**
				(Op: LZ4AX)	
KQ3V	*	2,336,796	1627	131	431
WR3Z	*	2,116,780	1412	128	417
N3NS	*	1,843,327	1378	114	379
				(Op: K3IPK)	
K3TEJ	*	1,586,304	1266	107	352
WX3B	*	1,400,298	1234	92	327
W3AP	*	1,130,646	1127	92	315
KB3TS	*	1,031,211	930	102	337
W3IQ	*	910,306	902	90	292
K4JLD/3	*	891,796	817	114	338
N3UM	*	880,620	858	92	298
N3WD	*	736,281	769	89	288
N3KR	*	681,876	710	84	288
N3RJ	*	567,132	726	75	259
N3OW	*	286,974	395	71	227
W3BYX	*	245,440	396	56	180
W3KV	*	197,861	386	62	179
W3AZ	*	143,166	329	61	153
AD3Z	*	125,512	303	78	154
N3FX	*	94,392	212	56	115
W3BEN	*	77,598	199	45	117
W3FQE	*	37,312	162	29	77
N3EA	*	33,491	141	33	74
N3HBX	**21**	**549,180**	**1257**	**34**	**128**
WA2C/3	*	303,600	790	33	117
WY3T	**14**	**144,596**	**452**	**31**	**117**
***W3LL**	**A**	**524,832**	**598**	**80**	**256**
***K3DSP**	**"**	**488,400**	**627**	**71**	**225**
*K3VY	*	267,927	422	66	187
*N2US/3	*	257,136	375	68	196
*N3HCN	*	138,288	293	55	146
*WN3VAW	*	137,214	238	70	161
*W3CP	*	136,881	261	67	160
*KI3P	*	76,440	189	53	115
*N3CB	*	49,912	164	48	88
*KT3D	*	45,012	140	37	87
*KF4WXD/3	*	43,806	133	46	101
*WB3CJU	*	34,760	154	30	80
*WA3G	*	34,320	140	36	84
*N3MX	*	28,910	113	40	78
*W3JRY	*	28,250	98	33	80
*N3FNE	*	27,807	118	29	64
*WA3KYY	*	20,944	107	27	61
*W3ARS	*	19,928	91	40	66
*AK3E	*	13,390	67	38	65
*N1VPA/3	*	10,920	90	15	45
*N3VOP	*	9,000	68	26	49
*AAØCY/3	*	3,978	40	8	26
*W3TT	*	3,978	47	18	33
				(Op: N9GG)	
*N3LLR	*	3,763	47	19	34
*W3DQ	*	3,124	27	20	24
*N3XL	*	546	13	9	12
***N3RW**	**28**	**131,180**	**347**	**30**	**110**
*N3LL	*	40,205	202	19	66
*W1NN/3	*	32,004	160	17	67
*K3GW	*	18,564	97	21	57
*K3NK	*	3,220	47	15	20
*KF3BN	21	11,220	72	19	41
*KB3FCS	*	2,720	43	8	26
***K3SWZ**	**14**	**111,244**	**309**	**33**	**104**
K4ZW	**A**	**6,168,400**	**3174**	**152**	**548**
N6AR/4	**"**	**2,874,864**	**1951**	**130**	**463**
NX9T/4	*	2,478,048	1841	116	382
W4WTB	*	2,420,132	1556	136	436
WA4TII	*	2,126,166	1624	116	381
K4BAI	*	1,937,754	1613	105	336
K4WX	*	1,900,646	1665	103	315
K4IE	*	1,360,450	1115	114	341
N4PQX	*	1,133,370	855	114	376
KØLUZ/4	*	1,112,480	1053	91	318
K4UTE	*	1,059,310	776	118	400
N2XD/4	*	1,051,840	1130	86	260
K4RO	*	1,040,568	1090	106	276
AG4W	*	1,020,083	948	101	320
W6NWS/4	*	988,260	960	98	292
N4DT	*	886,704	862	90	287
N4MM	*	864,152	747	110	326
N4CW	*	791,154	787	85	293
KD5M/4	*	760,836	763	104	322
W4YE	*	726,965	816	79	268
AC4PY	*	683,600	658	105	295
N4GU	*	570,024	601	95	256
W4NTI	*	569,723	655	91	252
KU4FP	*	432,432	519	85	251
K1KO/4	*	423,576	562	66	230
KG4NYV	*	411,220	549	86	204
K3WA/4	*	403,542	490	76	242
N4UH	*	367,632	490	96	237
N4EL	*	340,296	493	66	198
K4LTA	*	327,250	594	66	209
W4IR	*	326,634	395	78	225
NC4MI	*	298,530	449	81	198
K4FYM	*	290,719	449	62	185
K4FK	*	276,491	398	77	206
				(Op: W4SAA)	
W4RK	*	270,636	535	62	166
K4BP	*	259,644	356	86	195
N4DJ	*	255,626	380	72	194
W4KJ	*	254,000	426	68	182
W4IS	*	249,577	383	78	199
W7QF/4	*	241,200	347	77	191
WT2J/4	*	237,084	382	75	201
K4XG	*	235,755	331	83	196
KO7X/4	*	216,670	345	78	157
N4RQ	*	213,867	398	64	203
W4ATL	*	211,722	370	50	163
W4NZ	*	161,766	298	67	142
N4GI	*	160,488	280	64	152
K6JAT/4	*	149,947	293	76	141
KE4KMG	*	132,096	295	56	136
W4UFO	*	114,642	218	52	141
W4WNT	*	107,514	236	68	130
N4PD	*	98,644	215	60	122
K4OH	*	79,534	210	54	128
WA4IRE	*	77,330	159	46	139
N4TL	*	48,280	143	46	90
K4SLC	*	45,506	147	40	82
N8CH/4	*	43,848	134	34	92
WB2LEZ/4	*	43,030	139	47	83
KØCOP/4	*	33,387	127	26	67
KC4D	*	25,308	108	35	76
K4RDU	*	18,146	82	29	57
W4OGG	*	16,272	118	43	70
W4UM	*	10,570	71	23	47
KE4OAR	*	10,251	61	23	44
N4UXA	*	3,276	31	12	27
W4ZV	**28**	**1,027,900**	**1989**	**34**	**156**
K4WI	**"**	**850,500**	**1822**	**35**	**140**
N4BP	**"**	**685,562**	**1616**	**32**	**126**
NC4NC	*	202,908	577	31	117
N2FY/4	*	43,036	164	26	80
K1ZYW/4	*	31,024	203	26	86
W4LM	*	11,895	86	17	44
K4VUD	**21**	**347,400**	**933**	**33**	**117**
K4DXA	*	139,160	372	28	114
K4MD	*	15,834	112	24	54
K4XS	**7**	**291,942**	**716**	**32**	**115**
N8PR/4	*	57,938	188	28	90
K1EY/4	*	26,746	117	21	65
K4DN	*	23,387	95	24	67
K4TX	*	11,001	74	16	41
AA4MM	**3.7**	**17,040**	**106**	**16**	**55**
***NR3X/4**	**A**	**1,567,718**	**1302**	**105**	**358**
				(Op: N4YDU)	
***N4IG**	**"**	**1,245,335**	**1036**	**108**	**347**
***K4GKD**	**"**	**1,208,688**	**1002**	**109**	**338**
*K4BEV	*	897,213	849	101	310
*N1GC/4	*	805,098	755	100	306
*NA4K	*	769,650	804	91	259
*NS4T	*	686,894	761	94	283
*KK4TA	*	632,832	758	73	236
*KU8E/4	*	554,718	634	98	256
*N4NX	*	548,725	481	118	349
*KT4ZB	*	492,586	599	82	244
*WR4K	*	467,250	509	99	276
*N4PSE	*	464,286	563	97	250
*K4EU	*	409,656	506	93	219
*N4JED	*	342,380	509	70	195
*AA4RX	*	330,528	401	82	231
*KB4N	*	314,550	427	76	194
*N4EK	*	291,580	446	55	184
*KU3Q/4	*	283,696	513	64	174
*K4JAF	*	277,676	356	84	245
*W4YN	*	262,710	403	78	192
*KK4RV	*	254,745	417	67	188
*AB4MT	*	246,253	375	75	202
*KI3Q/4	*	221,712	344	67	181
*NU4B	*	208,221	321	65	182
*WN4M	*	207,557	400	55	144
*W4IHI	*	195,390	371	53	142
*K3HE/4	*	189,224	326	56	161
*WA4NRQ	*	187,500	460	63	187
*K4LOG	*	182,634	423	48	135
*KE4MIL	*	164,227	337	46	157
*W4TDB	*	163,184	344	72	145
*WA4JA	*	159,900	321	69	136
*K4UVT	*	149,586	254	63	170
*KG6AR/4	*	129,717	271	72	141
*N4WD	*	129,311	276	60	143
*KC2JT/4	*	128,492	266	51	131
*W9NWY/4	*	126,294	284	45	141
*KV4CN	*	125,584	264	58	130
*AA4LR	*	125,440	262	61	135
*N5LF/4	*	124,800	279	60	140
*K8FK/4	*	116,119	302	42	109
*W4QK	*	115,900	271	63	127
*WA2SRY/4	*	112,179	241	50	133
*K4RFK	*	102,416	226	52	121
*AB4GG	*	100,080	244	54	126
*W4DHE	*	99,301	243	64	135
*KR4LO	*	94,500	292	33	107
*N4DWK	*	91,690	216	44	129
*WR4F	*	88,172	204	55	133
*W4PC	*	87,096	201	59	132
*AA4KD	*	86,337	207	60	121
*W4ECL	*	85,136	250	33	103
*K4WES	*	71,720	195	53	110
*W4TIJ	*	66,444	179	46	99
*W4JH	*	60,258	192	32	89
*W4YA	*	56,736	155	39	105
*K9HUY/4	*	56,160	183	32	85
*KG4OJT	*	45,593	188	40	87
*W4XP	*	45,158	142	45	89
*K3MZ/4	*	42,750	139	33	81
*WA4FXX	*	36,934	131	37	81
*N2BT/4	*	33,062	110	40	82
*KE1F/4	*	30,591	136	36	67
*K4YJ	*	30,107	101	33	86
*KS4JB	*	28,420	107	29	69
*W4TME	*	26,384	122	33	64
*KX4F	*	22,896	101	36	72
*AF4MO	*	16,443	94	21	60
*K4AHC	*	14,520	179	33	77
*WB9BSH/4	*	14,091	70	28	49
*N7DLS/4	*	11,403	74	21	42
*K4LW	*	9,581	76	20	47
*K4BAM	*	9,373	113	37	66
*AA3VA/4	*	7,920	53	18	42
*KO4OL	*	6,016	51	18	29
*KG4RZH	*	5,661	42	15	36
*NJ3B/4	*	4,750	49	20	30
*WB4HUX	*	1,920	39	13	17
*K4GA	*	1,298	21	7	15
*KU4BP	*	1,092	15	11	15
***K6EID/4**	**28**	**185,640**	**501**	**28**	**112**
*K4GHS	*	129,010	373	30	103
*KC7STK/4	*	118,779	324	28	109
*NV4B	*	72,390	231	26	88
*W6DSQ/4	*	35,322	167	21	66
*AF4YA	*	26,424	142	19	53
*N4ZAK	*	10,440	80	18	42
*K4KHZ	*	156	8	4	8
***N4MO**	**21**	**235,221**	**554**	**33**	**128**
*N4JF	*	103,428	488	33	120
*NI4Y	*	13,593	84	19	50
***W4LC**	**14**	**89,027**	**269**	**30**	**97**
*KZ5OH/4	*	21,600	136	19	56
*W4BAA	*	13,176	80	18	54
*NQ4K	*	6,390	58	12	33
*N8IK/4	*	700	17	6	14
*K4JHK	*	532	26	13	15
K5TR	**A**	**1,940,776**	**1773**	**133**	**355**
K5ZO	**"**	**1,560,906**	**1305**	**143**	**360**
N5RZ	*	849,856	838	106	286
N5TY	*	665,575	755	100	237
K5LP	*	657,410	658	106	283
N5HI	*	612,612	643	98	259
AB5C	*	591,216	660	92	235
K5XR	*	491,878	520	97	294
				(Op: W5ASP)	
KE5K	*	454,896	552	93	219
N5DD	*	364,980	457	90	218
K1TU/5	*	248,805	391	92	193
N5LYG	*	221,932	411	69	157
N5QQ	*	156,176	259	68	159
N5VK	*	131,565	282	63	116
K5RX	**28**	**950,274**	**1996**	**35**	**151**
W5PR	**"**	**888,960**	**1851**	**35**	**157**
N5KB	*	39,794	151	22	79
W5TM	**21**	**484,330**	**1338**	**36**	**118**
				(Op: W5AO)	
K2BA/5	*	296,520	711	36	132
W9DX/5	*	205,840	528	33	122
K5RA	*	21,440	130	21	43
N5MV	**14**	**92,529**	**960**	**35**	**114**
KZ5A	*	60,298	314	30	88
W5GZ	7	3,264	45	15	17
W5FO	**3.7**	**12,600**	**116**	**19**	**44**
***N5AW**	**A**	**1,579,288**	**1179**	**135**	**401**
***WD5K**	**"**	**1,058,304**	**952**	**107**	**317**
*WØVX/5	*	395,307	512	77	220
*NN5T	*	303,502	439	75	188
*W5GAI	*	245,944	373	76	208
*WA5SOG	*	183,380	338	63	149
*W5WZ	*	129,500	294	55	120
*WQ5C	*	73,830	204	42	96
*W5CX	*	69,795	203	46	95
*W5RBF	*	68,700	199	51	99
*KM5WR	*	63,431	179	46	91
*N5CHA	*	49,104	148	60	84
*K5WW	*	29,197	133	35	62
*N5PU	*	18,531	110	26	61
*AD5LU	*	17,415	108	31	50
*KA5BAY	*	11,316	59	32	50
*KE5OG	*	7,884	57	19	35
*K5JFG	*	5,350	44	25	25
*W5/VE3VIP	*	5,096	46	21	35
*KK5XX	*	3,444	47	22	20
*N5NJ	*	1,305	19	12	17
***N5XJ**	**28**	**283,986**	**686**	**33**	**129**
***NX5N**	**"**	**225,760**	**638**	**33**	**127**
*KY5N	*	193,575	497	31	114
*KD5LNO	*	86,576	287	25	87
*W5MK	*	82,390	280	27	83
*KC5RPF	*	68,120	268	26	78
*K5LAN	*	12,078	88	18	43
*KC5LK	3.7	1,980	30	9	24
N6BV	**A**	**3,131,520**	**2595**	**136**	**344**
WR6M	**"**	**1,218,069**	**1298**	**111**	**258**
KI6CG	*	1,103,600	1163	106	250
N6ED	*	674,190	764	106	224
W6IXP	*	671,599	828	105	226
KC6X	*	639,318	652	106	275
WW6O	*	416,950	608	86	183
N6TW	*	356,730	478	90	192
N6NZ	*	346,918	450	93	193
W6FRH	*	272,155	416	93	172
N6VH	*	270,908	400	92	170
WA5VGI/6	*	252,747	407	86	167
W6SA	*	147,196	332	72	124
K6GT	*	137,352	309	73	121
K6III	*	113,400	244	74	126
KG6ENA	*	78,912	279	50	94
AI6O	*	75,187	225	59	102
KJ6GQ	*	71,736	292	40	58
K6SE	*	65,417	144	71	138
AD6KA	*	54,448	223	60	104
K6LRN	*	37,942	125	49	73
W6NK	*	37,728	122	50	81
KO6FR	*	28,050	116	40	62
WB6NFO	*	23,088	212	57	99
NY6Y	*	15,624	100	29	55
KI6IV	*	14,875	124	28	57
W6MVW	*	14,784	80	28	49
W6ISO	*	12,144	54	38	50
WO6M	*	11,715	88	31	40
AJ6V	*	11,704	72	32	45
N6UB	*	9,000	59	27	45
W1HDD/6	*	5,192	55	26	33
W6RKC	21	32,470	139	27	58
W6YD	*	11,385	74	23	46
K5KT/6	7	8,063	61	20	39
***N6NF**	**A**	**750,792**	**872**	**96**	**232**
***WN6K**	**"**	**502,016**	**691**	**94**	**202**
*K6XV	*	277,950	434	92	163
*KA6MAL	*	193,004	364	84	142
*AK6DV	*	135,172	273	70	118
*KG6NDO	*	121,604	285	57	115
*N6OPR	*	89,676	240	66	122
*ND2T/6	*	81,176	220	57	89
*AA6EE	*	78,120	231	59	96
*KD6PQF	*	61,623	222	48	75
				(Op: KD6PF)	
*KG6HAF	*	58,308	225	53	76
*W6KY	*	51,620	164	50	66
*K6OWL	*	46,746	179	46	60
*WB6NL	*	42,460	171	47	63
*K6BIR	*	41,700	161	41	59
*N6RZR	*	33,354	136	44	65
*KG6JOT	*	31,464	155	49	65
*W6SJ	*	31,200	168	42	78
*K6CA	*	30,044	134	58	90
*W6ZZZ	*	27,200	129	34	51
*K6CSL	*	23,496	105	38	50
*KK6MM	*	22,790	113	31	55
*KE6JAC	*	16,072	114	35	47
*AD6AB	*	14,378	103	36	43
*K6YV	*	14,134	84	32	42
*W6WR	*	13,604	104	30	46
*AA6PW	*	5,950	49	24	26
*K6ST	*	2,079	41	11	16
*WA6PX	*	2,070	29	23	22
*W6OUL	*	1,652	20	10	18
*N6GL	*	1,113	26	11	10
*KA1RRX/6	*	418	21	9	13
***WA7BNM/6**	**28**	**142,875**	**427**	**29**	**98**
*N6RV	*	104,562	377	27	84
*KO6TW	*	3,689	52	13	18
*K6UO	*	2,214	41	14	27
***W6AFA**	**21**	**307,784**	**759**	**36**	**122**
*NK6A	*	5,166	59	15	26
*KU6T	14	19,635	113	27	58
K5RR/7	**A**	**1,955,592**	**1572**	**127**	**344**
W7GG	**"**	**1,793,832**	**1495**	**144**	**348**
K7ZZ	*	1,192,744	1385	111	250
WA7LT	*	953,250	1059	118	257
K9JF/7	*	920,200	840	125	305
KG7H	*	877,070	939	111	272
N7GYD	*	873,276	977	102	264
N7TT	*	779,478	820	114	288
K7RI	*	617,175	774	101	224
NK7C	*	601,094	653	116	263
NE9Z/7	*	464,659	484	111	292
K7VI	*	406,695	549

*N8XWO	*	132,300	296	55	141
*N8BV	*	119,187	331	52	119
*KB8GSV	*	109,983	278	54	129
*AK8B	*	104,115	245	47	118
*N2OCW/8	*	70,975	207	57	110
*W8VE	*	61,800	182	53	97
*K8VUS	*	58,016	177	49	99
*W8WDX	*	46,625	150	36	89
*N8EN	*	45,360	165	47	93
*N8NYI	*	39,083	160	37	84
*KG8ZD	*	35,258	132	42	80
*WBØWAO/8	*	33,540	113	44	85
*KC8RAN	*	19,635	90	25	60
*KE4EE/8	*	15,400	91	27	50
*W8MKO	*	14,784	84	27	57
*N8XE	*	11,664	68	28	44
*N8VZ	*	10,920	63	33	45
*W8IDM	*	10,857	55	30	47
*WB8AEV	*	6,519	51	18	35
*KA8MPT	*	5,858	51	24	34
*KA8ZMY	*	5,100	78	20	55
*AB8NZ	*	4,992	47	18	34
*AF8C	*	640	12	9	11
***K8OZ**	**28**	**153,456**	**419**	**30**	**109**
*KE8NH	*	87,666	298	25	89
*N8MWK	*	86,625	260	28	97
*N8IA	*	5,900	55	15	35
*W8UMR	*	3,286	253	25	81
*AB8OJ	*	150	6	4	6
***KC8MNO**	**21**	**126,882**	**349**	**27**	**105**
***KA8WOL**	**"**	**122,346**	**353**	**26**	**100**
*K8IR	*	120,782	351	26	105
*NG3Q/8	*	98,892	297	29	105
N9RV	**A**	**5,638,400**	**3244**	**149**	**491**
W9RE	**"**	**4,769,154**	**2589**	**155**	**532**
WB9Z	**"**	**4,386,756**	**2499**	**160**	**508**
K9ZO	*	1,813,115	1386	128	407
N9QQK	*	530,934	615	83	238
KF9YR	*	474,275	589	81	230
K9BGL	*	420,869	508	105	218
AC9X	*	292,896	455	80	208
K9SG	*	276,491	431	85	198
K9IZT	*	254,250	452	67	158
KF9TI	*	194,120	463	63	157
W9FGH	*	120,196	245	61	138
WA9TPQ	*	11,310	54	26	52
W9YYG	28	35,910	165	26	69
W9OP	**21**	**193,522**	**477**	**34**	**127**
W9JA	*	109,324	332	31	120
K9CAN	**14**	**94,381**	**273**	**34**	**105**
W9SE	**7**	**30,096**	**142**	**22**	**66**
N9QX	*	17,787	109	16	61
***N4TZ/9**	**A**	**1,743,126**	**1214**	**134**	**405**
***K9JE**	**"**	**614,184**	**695**	**81**	**245**
*KC9UM	*	483,600	621	81	231
*W9RN	*	326,425	464	80	195
*K9JLS	*	277,554	370	80	197
*K9DXR	*	255,900	350	82	218
*NV8V/9	*	242,612	405	81	181
*K9MI	*	190,035	346	59	146
*W9LYN	*	161,394	304	71	151
*WR9A	*	149,760	305	46	146
*KK9DX	*	123,753	220	69	144
*WØHED/9	*	113,696	237	46	130
*K9PY	*	101,374	237	61	121
*N9RLA	*	99,866	251	55	112
*N9TU	*	97,440	271	61	142
*N9XD	*	90,868	236	55	113
*W9TY	*	73,298	223	43	91
			(Op: WD9FEN)		
*W9XYL	*	70,992	235	51	123
*K9JIG	*	60,450	165	43	107
*N9LF	*	58,464	183	49	95
*K9IJ	*	56,780	156	62	105
*W9CEO	*	54,934	184	34	87
*W9VQ	*	50,355	157	41	94
*W9AKS	*	46,768	157	51	97
*WI9M	*	42,704	149	49	87
*W9DLS	*	40,936	143	33	86
*K9OSH	*	24,024	98	36	68
*N9WK	*	23,214	88	41	65
*N9TF	*	14,694	60	38	55
*N9KO	*	11,524	71	26	41
*W3HDH/9	*	8,866	55	25	37
*WB2TLQ/9	*	4,623	48	31	36
*K9EFP	*	2,679	34	23	24
*KC6VMM/9	*	864	36	23	25
***KE9S**	**28**	**183,264**	**500**	**30**	**108**
*KC9ARR	*	93,462	348	27	84
***AG9S**	**21**	**186,202**	**439**	**31**	**125**
***KX9X**	**"**	**167,850**	**450**	**32**	**118**
*W9WJ	*	30,900	131	27	73
NRØX	**A**	**2,150,608**	**1399**	**128**	**428**
KØKX	**"**	**2,069,496**	**1327**	**141**	**453**
WØBV	*	1,083,148	841	124	354
WAØMHJ	*	994,204	918	101	297
KØOU	*	869,610	864	112	298
KØRH	*	844,800	889	106	278
K9MWM/Ø	*	583,684	736	104	233
K9WIE/Ø	*	488,898	607	84	230
KBØENE	*	428,043	528	94	233
KØGAS	*	364,364	537	93	193
NØIJ	*	333,207	430	86	215
KBØYH	*	327,997	443	85	198
KMØO	*	262,140	423	71	186
WØOR	*	243,219	398	79	172
KØJPL	*	208,494	370	89	154
WØTT	*	180,632	317	75	193
K4IU/Ø	*	178,596	322	78	164
WØMW	*	147,150	286	72	146
AE9B/Ø	*	129,729	199	87	162
WØPPF	*	111,744	270	58	136
KØOAT	*	93,884	226	60	136
K9FC/Ø	*	89,440	217	81	134
WØDET	*	78,147	197	59	112
KØFG	*	54,925	137	58	111
WØOSK	*	49,588	149	65	89
WØML	*	47,970	153	45	85
AAØA	*	20,691	91	35	64
N6BXQ/Ø	*	17,296	102	40	54
ABØWR	*	7,446	56	29	44
KØHB	*	5,382	48	18	28
NØUU	**28**	**182,754**	**477**	**32**	**111**
K4VX/Ø	*	125,100	346	31	108
KVØQ	**21**	**633,476**	**1465**	**37**	**135**
KR6NA/Ø	**14**	**104,604**	**372**	**32**	**106**
KØQV	*	23,140	118	27	62
KØGT	**3.7**	**13,200**	**86**	**20**	**46**
***ACØW**	**A**	**1,138,382**	**1023**	**112**	**322**
***ACØX**	*****	**592,106**	**721**	**100**	**266**
*KØXH	*	501,831	633	94	239
*KØGEO	*	488,225	612	75	220
*WØETT	*	466,560	586	89	235
*KØSQ	*	341,217	471	80	199
*KØFX	*	229,457	364	91	178
*WØRSR	*	165,393	297	64	143
*AAØAW	*	148,070	276	69	152
*ACØJ	*	147,312	232	75	189
*WBØYJT	*	138,924	317	58	146
*WAØDC8	*	132,240	297	60	130
*KØPY	*	108,647	276	59	128
*WØMDS	*	101,623	269	45	106
*KAØZPP	*	93,775	231	50	105
*K2HT/Ø	*	90,835	243	60	125
*WØWG	*	82,368	228	68	140
*NØLGU	*	69,273	184	61	118
*WBØULX	*	48,510	133	47	100
*WØIE	*	46,280	160	48	82
*KBØARZ	*	40,905	153	48	87
*AD9P/Ø	*	39,501	138	53	80
*KØRY	*	34,138	132	37	64
*WØCBH	*	33,602	143	39	67
*NØPO	*	30,613	103	47	74
*WBØDUL	*	22,842	109	36	58
*NØNB	*	20,176	106	40	57
*KAØDAQ	*	19,320	99	27	65
*KØMPH	*	16,296	80	33	51
*WØRXL	*	14,190	80	36	50
*KCØIGY	*	5,508	50	23	28
*NØLZ	*	2,379	25	17	22
***KØYR**	**28**	**70,104**	**214**	**27**	**100**
*KØUIV	*	13,601	97	22	45
*KNØV	*	2,184	29	12	16
*KCØIDI	*	703	14	5	14
***WØAH**	**21**	**243,162**	**647**	**35**	**127**
*WØZA	*	109,056	365	29	99
*N3XT/Ø	14	10,962	94	23	40
*KCØATC	*	1,120	21	12	16
***KU1CW/Ø**	**7**	**22,596**	**117**	**23**	**61**
*KAØCT	*	2,726	55	17	30
*NØHF	*	1,290	24	12	18
		ALASKA			
*KLØWX	A	1,200	28	12	13
		BARBADOS			
*8P6FH	A	117,750	488	42	83
		BELIZE			
***V31BD**	**A**	**1,993,572**	**2743**	**74**	**250**
			(Op: WQ7R)		
*V31MD	*	353,080	719	84	196
		BERMUDA			
***VP9AD**	**A**	**167,808**	**335**	**68**	**160**
		CANADA			
VO1TA	**A**	**2,458,988**	**2415**	**87**	**284**
VE1ZJ	**"**	**1,904,175**	**1854**	**107**	**348**
VE9XA	*	411,600	504	86	257
VO1MP	**21**	**1,214,751**	**2721**	**34**	**143**
VE1JX	*	934,857	2217	34	137
***VE1JS**	**A**	**933,075**	**1130**	**72**	**247**
*VO1BC	*	924,000	1374	63	212
*VE9DX	*	437,892	639	66	207
*VE1ADE	28	30,276	540	14	15
*VE1EQO	14	30,576	201	21	63
VY2ZM	**A**	**8,206,100**	**4836**	**146**	**519**
VE3EY/2	**"**	**4,305,211**	**3231**	**124**	**429**
VE2AYU	*	1,321,284	1247	96	316
VO2WL	*	575,125	1274	60	155
			(Op: VO2NS)		
VE2OTT	**14**	**124,335**	**375**	**28**	**107**
VE2ZP	**3.7**	**119,280**	**748**	**21**	**63**
***VE2GSO**	**A**	**596,232**	**1410**	**44**	**152**
***CK2AWR**	**"**	**326,199**	**597**	**69**	**158**
			(Op: VE2AWR)		
*CJ2IC	*	202,334	468	53	134
			(Op: VA2IC)		
*VA2ADB	*	96,906	227	61	125
*CK2EM	*	88,885	259	42	103
			(Op: VA3TEE)		
*VE2SB	14	21,513	154	20	51
*VE2LHP	*	14,728	127	15	41
VE3EJ	**A**	**8,498,500**	**4603**	**164**	**575**
CK3AT	**"**	**6,341,400**	**4366**	**143**	**457**
			(Op: VE3AT)		
VE3ANX	**"**	**3,540,320**	**3249**	**115**	**349**
CK3KZ	*	2,128,722	1609	124	402
			(Op: VE3KZ)		
VE3NE	*	811,275	929	101	272
VE3PN	*	759,660	1014	100	230
VE3YQY	*	261,498	479	63	183
VE3SY	*	209,708	474	67	139
VA3KA	*	65,190	138	98	107
VA3SPN	*	3,268	42	14	24
VE3FU	**7**	**71,645**	**379**	**18**	**71**
***VE3BUC**	**A**	**1,116,762**	**1241**	**101**	**272**
***VE3CR**	**"**	**1,041,796**	**1002**	**97**	**309**
*VE3KP	*	489,526	650	81	233
*VA3XRZ	*	343,628	553	65	206
*VE3/ VY2MGY	*	299,532	661	66	152
*VE3EN	*	290,604	487	61	183
*VE3FWA	*	259,831	436	69	184
*VE3RSA	*	221,706	396	62	164
*VE3OM	*	153,816	266	62	170
*VE3JAQ	*	142,040	499	62	150
*VE3GLO	*	109,480	292	58	112
*VA3IX	*	89,595	294	56	109
*VE3XB	*	89,424	217	58	126
*VE3UOT	*	69,741	200	28	95
			(Op: VE3GD)		
*VE3NQM	*	41,454	169	29	69
*VA3TPV	*	37,714	131	32	77
*VE3RCN	*	34,592	159	29	63
*VE3OIL	*	31,828	135	38	71
***VA3FP**	**21**	**74,304**	**261**	**23**	**85**
***VE3XAX**	**1.8**	**4,512**	**170**	**6**	**10**
*VE3EDY	*	310	45	3	2
VE4IM	**A**	**187,798**	**384**	**79**	**154**
***VE4YU**	**A**	**281,000**	**462**	**78**	**172**
*VE4HAZ	*	21,586	131	39	47
*VE4RP	*	10,147	89	32	41
CJ5DX	**A**	**2,413,015**	**3249**	**103**	**262**
			(Op: VA5DX)		
VE5FX	*	618,268	984	78	206
***VE5SF**	**A**	**857,463**	**1412**	**87**	**202**
*VE5AAD	*	98,423	455	49	64
*VE5JL	*	4,068	62	17	19
VE5UA/6	**A**	**812,567**	**1150**	**111**	**232**
CK6JY	**21**	**497,097**	**1234**	**37**	**134**
			(Op: VE5MX)		
CJ6MA	**7**	**76,139**	**594**	**25**	**48**
*VA6JJ	A	495	28	8	7
***CJ6WGO**	**28**	**133,052**	**1024**	**22**	**52**
***CK6EX**	**14**	**83,725**	**510**	**24**	**61**
VE7IN	**A**	**819,330**	**1153**	**102**	**208**
VE7VR	*	372,998	770	72	146
VE7IO	*	88,872	235	53	131
VE7XO	*	47,628	165	40	68
VE7GL	**7**	**89,688**	**632**	**25**	**49**
			(Op: VA7OO)		
***VE7FO**	**A**	**398,315**	**959**	**71**	**134**
*VE7UQ	*	258,588	580	67	131
*CJ7DP	*	115,000	678	43	49
			(Op: VA7DP)		
*VA7LC	*	92,594	306	48	86
*VE7NGR	*	48,836	198	51	65
*VE7XB	*	11,972	67	37	45
***VE7UF**	**21**	**227,800**	**936**	**29**	**71**
			(Op: VE7NS)		
VY1JA	A	5,200	47	25	25
***VY1MB**	**A**	**30,312**	**205**	**31**	**41**
		CAYMAN ISLANDS			
ZF2NT	**A**	**6,943,086**	**6429**	**127**	**372**
			(Op: N6NT)		
ZF2AH	**7**	**250,614**	**1154**	**24**	**95**
			(Op: W6VNR)		
		COSTA RICA			
TI8/W5AA	**A**	**595,808**	**1629**	**50**	**122**
***TI2KAC**	**A**	**1,224,990**	**1562**	**97**	**252**
*TI2DLL	*	340,410	742	64	146
		CUBA			
CO8ZZ	**A**	**2,957,764**	**3065**	**110**	**348**
CO2JG	*	75,522	786	25	57
***CO3JO**	**A**	**303,096**	**873**	**53**	**120**
***CO2TK**	**28**	**389,544**	**1642**	**28**	**88**
		DOMINICAN REPUBLIC			
*HI3LFE	A	3,234	52	15	18
*HI3CR	28	33,840	363	16	31
***HI8ROX**	**21**	**162,392**	**697**	**23**	**83**
		GREENLAND			
OX3HX	**A**	**64,870**	**247**	**45**	**85**
*OX3DB	A	100	6	6	6
		GRENADA			
***J37LR**	**A**	**310,607**	**788**	**54**	**133**
			(Op: VE3EBN)		
		HONDURAS			
***HR1AAB**	**A**	**61,596**	**574**	**31**	**56**
***HR1AGC**	**28**	**152,605**	**553**	**27**	**88**
		JAMAICA			
***6Y9X**	**A**	**2,320,131**	**2549**	**105**	**316**
			(Op: K1XM)		
*6Y5/N7CQQ	*	83,616	264	49	107
		MARTINIQUE			
TO5A	**A**	**6,923,023**	**5630**	**127**	**442**
			(Op: NH7A)		
		MEXICO			
XE2AC	**A**	**1,965,978**	**2500**	**106**	**272**
6J1MM	**"**	**1,194,250**	**2312**	**75**	**175**
			(Op: XE1MM)		
6F1LM	*	295,834	1268	39	80
			(Op: XE1VIC)		
4A1AC	*	293,412	1411	27	71
			(Op: XE1AC)		
6J2MX	*	283,536	488	91	173
			(Op: XE2MX)		
***6J2K**	**A**	**1,356,309**	**2007**	**109**	**224**
			(Op: XE2K)		
***6J1UN**	**"**	**1,010,680**	**2196**	**73**	**147**
			(Op: XE1UN)		
*6J2AUB	*	573,464	1353	62	132
			(Op: XE2AUB)		
*6J2TZP	*	183,008	668	72	100
			(Op: XE2TZP)		
*6J1MEX	*	182,466	350	63	155
			(Op: XE1MEX)		
*6J1NK	*	34,770	285	27	34
			(Op: XE1NK)		
***XE1CT**	**28**	**320,006**	**1217**	**28**	**94**
*XE1ZGG	*	15,260	322	14	21
		PANAMA			
***HP1BYS**	**14**	**332,905**	**1140**	**32**	**107**
		PUERTO RICO			
KP3Z	**A**	**15,655,517**	**8656**	**165**	**592**
			(Op: N5TJ)		
***WP4LNY**	**A**	**444,925**	**1178**	**56**	**129**
*WP3GW	*	344,250	491	64	206
*WP4BV	*	322,644	939	47	120
*KP4JRS	*	52,725	201	36	75
*KP4XB	*	21,505	107	32	53
*NP4CO	*	782	18	11	12
***WP3C**	**28**	**819,672**	**2303**	**31**	**116**
***WP4EDD**	**7**	**18,970**	**195**	**14**	**56**
		ST. KITTS & NEVIS			
V47KP	**A**	**6,196,554**	**4830**	**125**	**421**
			(Op: W2OX)		
		SAINT MARTIN			
FS/AH8DX	**A**	**8,646,482**	**6315**	**130**	**468**
		U.S. VIRGIN ISLANDS			
KP2A	**21**	**1,795,425**	**4034**	**39**	**146**
			(Op: KW8N)		
***KP2/K2SGH**	**A**	**21,364**	**98**	**35**	**63**
		AFRICA			
		AFRICAN ITALY			
IG9A	**14**	**2,235,534**	**3925**	**40**	**162**
			(Op: IT9GSF)		
IG9V	**3.7**	**261,423**	**1065**	**15**	**78**
			(Op: IKØYVV)		
		BENIN			
TYØT	**28**	**2,418,341**	**4716**	**38**	**143**
			(Op: I8QLS)		
TY3M	**21**	**2,332,568**	**4441**	**38**	**146**
			(Op: W1NA)		
		CANARY ISLANDS			
EA8BU	**A**	**909,880**	**1065**	**78**	**266**
EA8ADM	*	1,073	25	13	16
EA8LS	**21**	**308,022**	**832**	**34**	**109**
EA8SP	**3.7**	**66,750**	**343**	**14**	**61**
***EA8IK**	**A**	**146,916**	**290**	**54**	**144**
*EA8AD	*	14,592	88	29	47
*EA8BMP	*	10,290	52	27	43
***EA8TX**	**28**	**1,106,481**	**2462**	**35**	**124**
*EA8AG	*	519,677	1839	30	101
*EA8BMH	*	4,982	39	14	33
*EA8ARG	14	40,120	175	19	66
		CAPE VERDE			
***D44TD**	**A**	**11,199,793**	**6097**	**141**	**508**
			(Op: IV3TAN)		
		CEUTA & MELILLA			
EA9LZ	**7**	**717,831**	**2072**	**30**	**111**
***EA9AR**	**A**	**842,880**	**957**	**72**	**248**
		EGYPT			
***SU9US**	**A**	**468,321**	**824**	**49**	**154**
			(Op: K4RB)		
		ETHIOPIA			
ET3AA	**28**	**157,302**	**702**	**15**	**66**
			(Op: RX3DD)		
		GHANA			
***9G5MD**	**A**	**2,661,100**	**2873**	**80**	**245**
			(Op: F6VCR)		
		KENYA			
5Z4IC	**28**	**740,733**	**1944**	**36**	**111**
		MADAGASCAR			
5R8FU	**A**	**692,624**	**829**	**83**	**209**
		MADEIRA ISLANDS			
***CT3KN**	**A**	**2,312,981**	**2832**	**87**	**320**
		MOROCCO			
CN2R	**A**	**14,220,891**	**7281**	**145**	**552**
			(Op: W7EJ)		
***CN8NK**	**A**	**2,436,591**	**2304**	**89**	**290**
		NIGER			
5U7JK	**A**	**2,663,599**	**3269**	**62**	**219**
		NIGERIA			
***5NØNHD**	**A**	**698,000**	**1003**	**54**	**196**
			(Op: JK1UWY)		
		SENEGAL			
***6W/F6HLC**	**A**	**4,904,544**	**4542**	**85**	**291**
		SOUTH AFRICA			
ZS4TX	**A**	**621,093**	**1202**	**60**	**117**
ZS1DX	*	44,055	165	41	58
ZS6WPX	**28**	**1,434,680**	**2934**	**36**	**142**
ZS5NK	*	559,368	1498	33	103
ZS6Z	**14**	**1,079,760**	**2130**	**38**	**138**
			(Op: JM1CAX)		
***ZS4U**	**A**	**182,351**	**396**	**56**	**113**
*ZS6JM	*	154,687	347	52	111
*ZS6DDX	*	62,125	294	51	74
			(Op: ZS6HWC)		
*ZS6RAE	*	51,425	156	49	72
*ZS4BS	*	28,107	127	33	48
*ZS4NS	*	6,630	72	14	20
*ZS4MS	*	420	11	7	7
		TUNISIA			
3V8BB	**A**	**11,110,708**	**5688**	**150**	**592**
			(Op: YT1AD)		
		ZIMBABWE			
Z24S	**28**	**2,784**	**29**	**11**	**21**
		ZAIRE			
9S1X	**21**	**1,498,350**	**3080**	**36**	**139**
			(Op: F6BLQ)		
		ASIA			
		ASIATIC RUSSIA			
UA9CLB	**A**	**3,240,270**	**2469**	**120**	**375**
RZ9HG	**"**	**3,062,862**	**2329**	**131**	**427**
UA9JDP	*	1,430,698	1942	73	225
RV9BB	*	1,118,416	887	106	388
RZ9SR	*	733,913	774	85	276
UA9BS	*	661,902	836	78	243
UA9CKS	*	70,077	197	43	98
UA9KM	*	63,364	167	59	87
RW9TA	*	61,311	212	23	84
UA9FM	*	25,134	102	41	77
UA9YAB	**28**	**414,492**	**1236**	**29**	**127**
RA9UV	*	156,200	674	24	86
UA9HR	*	31,930	224	15	47
RZ9UN	**21**	**502,653**	**1598**	**33**	**104**
RK9CZO	*	317,115	854	32	113
UA9KJ	*	296,940	867	35	112
UA9OS	*	283,662	823	33	120
RA9ST	*	121,329	544	27	90
UA9ZZ	**7**	**169,386**	**578**	**26**	**85**
RX9TZ	*	27,720	183	13	50
***UA9ACJ**	**A**	**813,192**	**856**	**77**	**295**
***RA9FLW**	**"**	**742,836**	**947**	**75**	**234**
*UA9OJG	*	394,240	884	63	161
*RK9CR	*	286,254	511	55	188
*UA9YE	*	233,334	362	68	193
*RA9MJ	*	220,651	429	66	167
*UA9XL	*	182,094	413	40	138
*RK9AWA	*	166,140	382	52	143
*UA9XF	*	145,145	296	46	157
*UA9CR	*	123,959	273	53	138
*UA9AX	*	101,574	211	65	144
*RX9CEL	*	96,330	295	30	100
*UA9OA	*	82,061	264	36	97
*RA9DZ	*	54,128	171	40	96
*UA9OSV	*	47,520	198	29	70
*RA9KM	*	10,878	77	29	45
***RA9SD**	**28**	**353,864**	**985**	**30**	**112**
*RA9FEL	*	168,848	549	27	95
*RA9AU	*	143,129	458	27	100
*UA9XOJ	*	61,576	303	20	66
*UA9OUB	*	52,800	290	16	64
*UA9QFF	*	38,376	251	17	61
*UA9LAU	*	35,870	218	22	63
*UA9CQR	*	17,120	198	17	63
*RW9QA	21	23,562	140	15	51
***RK9AWC**	**14**	**317,756**	**861**	**32**	**116**
			(Op: RZ9AZ)		
*UA9MQR	*	109,836	383	26	82
*RU9AC	*	63,014	285	25	73
*RA9XE	*	38,160	206	20	52
*UA9FGJ	*	35,520	186	15	59
*RA9UAG	*	2,418	38	9	22
*RV9PP	*	192	13	8	8
***UA9AYA**	**7**	**192,786**	**603**	**28**	**99**
			(Op: UA9BA)		
***UA9OC**	**3.7**	**20,532**	**156**	**13**	**45**
***UA9YMT**	**1.8**	**8,774**	**128**	**9**	**32**
*RU9TS	*	5,412	69	8	25
UAØANW	**A**	**843,714**	**1160**	**96**	**246**
UAØAPV	**"**	**660,705**	**1098**	**65**	**190**
RWØCF	*	238,091	415	97	204
UAØCW	*	18,711	70	36	63
UAØCA	*	1,368	19	17	19
RZØSR	**28**	**351,528**	**1150**	**32**	**119**
RXØAE	*	156,825	617	28	95
RSØF	**21**	**477,710**	**1485**	**35**	**120**
			(Op: UAØFZ)		
RNØCT	**7**	**287,283**	**1147**	**33**	**98**
			(Op: RNØCN)		
RAØALM	*	38,634	190	26	68
***UAØSJ**	**A**	**477,680**	**739**	**76**	**204**
***UAØSE**	**"**	**430,817**	**827**	**64**	**169**
***RUØAT**	**"**	**376,464**	**667**	**76**	**200**
*UAØACG	*	291,606	548	82	180
*UAØFBS	*	136,784	374	76	130
*UAØYAY	*	131,610	267	69	145
*UAØQNV	*	36,900	192	45	78
*RAØCL	*	26,145	163	44	61
*UAØIV	*	20,777	172	35	44
*RAØCAH	*	18,711	140	31	50
*RUØAE	*	14,175	97	18	45
***UAØJB**	**21**	**195,480**	**899**	**34**	**86**
***RWØAR**	**14**	**50,150**	**276**	**24**	**61**
		ASIATIC TURKEY			
TA3DD	**A**	**662,662**	**768**	**89**	**242**
TA1E/Ø	**21**	**191,823**	**1308**	**29**	**100**
TA3YJ	**1.8**	**1,120**	**20**	**5**	**15**
***TA2RC**	**A**	**303,840**	**558**	**54**	**157**
*TA3D	*	244,488	393	60	184
*TA3EL	28	972	56	12	24
***TA2IJ**	**21**	**139,040**	**628**	**18**	**62**
*TA2IB	*	127,785	508	24	81
***TA3AK**	**14**	**78,073**	**286**	**22**	**79**
*TA2LJ	*	42,897	255	16	63
*TA3BE	*	4	2	2	2
***TA3J**	**1.8**	**58,410**	**367**	**9**	**50**
		CAMBODIA			
***XU7ACD**	**28**	**161,136**	**780**	**29**	**79**
			(Op: JF6DEA)		
		CHINA			
BY1DX	**28**	**151,032**	**787**	**21**	**66**
			(Op: OH6YF)		
***BD5RT**	**28**	**252,174**	**1292**	**32**	**74**
*BD8TG	*	24,766	167	16	42
			(Op: RK3DT)		
		CYPRUS			
H22H	**21**	**1,592,981**	**3345**	**39**	**142**
			(Op: 5B4MF)		
C4A	**1.8**	**95,140**	**508**	**10**	**61**
			(Op: 5B4ADA)		
		GEORGIA			
***4L8A**	**28**	**883,407**	**1850**	**39**	**138**
		HONG KONG			
VR2BG	28	1,504	21	13	19
		INDIA			
VU2PAI	**A**	**1,833,538**	**1620**	**103**	**324**
VU2WAP	*	774,501	1101	76	197
VU2SWS	*	686,178	888	69	222
***VU3DJQ**	**14**	**47,058**	**244**	**25**	**68**
		IRAQ			
YI9OM	**A**	**4,544,427**	**4005**	**97**	**314**
			(Op: OM6TX)

*JA1XRH	*	185,459	331	74	153
*JA1IZ	*	135,828	279	74	124
*JR1MRG	*	134,640	310	60	116
*JA1BPN	*	119,796	247	77	122
*JA1KK	*	113,928	300	63	125
*JG3NKP/1	*	113,575	249	60	115
*JA1HFY	*	104,980	282	64	117
*JH1FNU	*	102,546	278	50	112
*JA1XPU	*	93,312	231	65	97
*JA1RRA	*	61,800	201	43	77
*JA1XUY	*	52,934	154	47	86
*JA1PYP	*	37,996	144	46	72
*JF1MOS	*	36,848	141	37	61
*JA1BNW	*	26,196	94	40	78
*JA1CP	*	25,677	142	33	48
*JA1ANF	*	23,320	89	41	65
*JH1OLB	*	20,592	119	31	35
*JG1TCV	*	19,380	95	37	58
*JI3KHN/1	*	19,166	94	27	47
*JA1IZZ	*	16,544	70	39	49
*JR1WYV	*	10,701	82	38	49
*JE1PJR	*	10,608	89	25	27
*JK1EBA	*	10,032	53	32	44
*JA1LBZ	*	8,820	61	27	33
*JH1TUX	*	5,700	59	23	37
*7L3IUE	*	2,960	29	19	21
*7J1BAR	*	2,840	34	20	20
*JA6AGI/1	*	1,786	22	17	21
*JN1ONV	*	1,221	29	14	19
*JG1FGL	*	1,128	21	10	14
*JA1STY	*	810	17	14	16
JA1SWB	**28**	**232,092**	**693**	**34**	**92**
JHØNVX/1	**"**	**143,960**	**455**	**33**	**89**
*JA1BUI	*	108,004	381	31	93
*JG1TVK	*	105,392	370	31	81
*JA1VVH	*	96,524	371	31	87
*7N2UQC	*	44,718	212	27	60
*JH1CML	*	34,441	239	29	72
*JK1OXU	*	33,770	139	31	79
*JA1BBA	*	29,106	156	26	51
*JE1REU	*	9,177	71	19	38
*7K2PBB	*	6,380	59	15	29
*JA1EMQ	*	4,608	52	19	29
*JA1AAT	*	1,596	27	16	22
*JI1HFJ	*	1,380	29	10	10
JQ1BNL	**21**	**128,876**	**506**	**32**	**84**
7K4XNN	**"**	**95,162**	**471**	**30**	**63**
*JE1RRK	*	67,670	288	30	71
*JH1FOP	*	14,927	130	21	38
*JK1BII	*	5,985	55	18	27
*JE1JAC	*	4,640	53	16	24
*7L4SCQ/1	*	1,581	32	12	19
*JH1NXU	*	100	3	3	3
JH1UUT	**14**	**16,704**	**110**	**25**	**47**
*JE1GZB	*	5,600	44	17	33
*7L1FFH	7	1,131	24	13	16
*JE1SPY	3.7	558	26	8	10
JA2BNN	**A**	**1,329,377**	**1396**	**117**	**242**
JA2FSM	**"**	**1,047,574**	**1083**	**118**	**256**
JH2BTM	*	171,190	357	65	125
JA2BQX	*	113,100	336	55	101
JJ2PUG	*	59,328	161	49	95
JA2QVP	*	1,904	27	12	22
JG2SON	**28**	**203,490**	**606**	**35**	**98**
JF2FIU	21	1,988	28	13	15
JA2QJ	**A**	**159,120**	**348**	**60**	**120**
JA2GHP	**"**	**146,537**	**377**	**53**	**110**
*JA2VZL	*	98,505	244	62	103
*JA2JTN	*	93,765	289	46	87
*JK2VGC	*	43,792	142	47	89
*JA2KPW	*	38,812	140	46	78
JG2KKG	**28**	**176,948**	**584**	**32**	**92**
*JG2TKH	*	61,983	236	29	68
*JI2IWB	*	1,512	24	12	16
JE2HVC	**21**	**76,140**	**271**	**27**	**81**
*JQ1AHZ/2	*	50,778	230	27	66
*JA2IZA	*	16,821	131	20	43
*JA2KKA	*	13,886	104	20	33
*JA2QQC	*	12,420	105	20	40
*JF2FKJ	*	3,080	43	14	21
*JA2EAB	*	1,653	47	12	17
JE2QTM	**3.7**	**980**	**28**	**8**	**12**
JR3NZC	**A**	**429,704**	**815**	**74**	**135**
JA3TVQ	*	86,432	265	46	100
JF3CCN	*	55,233	143	59	94
JG3WCZ	*	100	3	3	3
JI3BFC	**14**	**160,473**	**401**	**37**	**112**
JR3RIY	**A**	**505,856**	**762**	**81**	**175**
JE6EKC/3	**"**	**499,800**	**801**	**77**	**168**
*JA1RKI/3	*	261,602	441	80	162
*JA3MVI	*	202,404	368	73	129
*JH3QXM	*	192,258	403	62	136
*JH3CUL	*	172,272	321	77	145
*JA3LEZ	*	99,519	248	44	103
*JL3RDC	*	74,408	231	45	97
*JI3VUB	*	55,594	290	25	52
*JR3EOI	*	40,602	126	54	80
*JA3DAY	*	30,500	97	47	75
*JA3UWB	*	26,988	130	20	58
*JR3XEX	*	7,936	58	23	39
*JM3HYL	*	2,911	41	19	22
*JE3GNN	*	1,885	23	13	16
JF3BFS	**28**	**306,332**	**853**	**34**	**103**
*JA3LKE	*	37,884	186	25	59
*JM3AVI	*	18,216	105	25	47
*JA3PYH	*	7,579	65	19	34
*JJ3OOZ	*	5,859	87	21	42
*JA3KDJ	*	476	19	6	8
JF3IYW	**21**	**72,600**	**291**	**29**	**71**
*JA3BBG	*	8,232	74	18	31
*JK3AHS	*	1,056	25	11	13
*JR3KAH	*	629	15	6	11
*JI3MCM	*	350	22	10	15
*JG3DOR	7	12	2	1	2
JH4UYB	**A**	**4,871,728**	**3206**	**150**	**434**
JG4AKL	**"**	**711,942**	**958**	**103**	**219**
JA4DPL	*	180,900	402	62	118
JA4ESR	*	178,048	348	81	133
JA4DHN	*	101,688	208	76	147
JR4QZH	**A**	**153,400**	**286**	**66**	**134**
*JG4OOU	*	132,183	355	54	117
*JE4MHL	*	59,976	162	56	91
*JA4BAA	*	45,704	157	46	70
JR4GPA	**28**	**74,545**	**347**	**24**	**61**
*JA4AQR	*	45,414	204	24	63
*JA4ETH	*	27,468	194	23	61
*JG4OHX	*	144	6	6	6
JM4WUZ	**3.7**	**2,160**	**35**	**13**	**17**
JA5OVU	**A**	**4,568,158**	**3481**	**131**	**351**
JA5IP	*	338,528	493	102	196
JA5GSG	*	20,757	175	40	71
JH5FXP	**21**	**1,300,065**	**2650**	**38**	**139**
JA5APU	*	160,126	541	33	85
JA5EO	**A**	**129,283**	**330**	**59**	**102**
JA5ATN	**28**	**38,313**	**217**	**22**	**59**
*JF5FGY	*	24,119	118	29	60
*JG5VIA	14	1,638	32	13	26
*JA5PDS	7	1,593	29	11	16
JA6GCE	**A**	**3,538,112**	**2945**	**131**	**341**
JA6AV	28	53,045	209	28	75
JA6WW	*	18,640	121	28	52
JR6EZE	**21**	**806,823**	**1904**	**36**	**121**
JJ6DGP	*	25,116	119	25	53
JR4PMX/6	**A**	**115,052**	**232**	**64**	**132**
*JA6SRB	*	103,029	240	70	113
*JS6GIM	*	17,313	82	34	53
JN6GBB	**28**	**79,872**	**304**	**27**	**77**
JA6EFT	**"**	**70,035**	**272**	**30**	**75**
*JA6PL	*	25,102	139	25	52
*JK6ISK	21	3,861	53	18	21
*JL6IPK	7	3,456	47	16	20
JA7NVF	**A**	**2,307,591**	**2218**	**131**	**298**
JA7JH	*	97,110	197	74	121
JA7QWD	**28**	**712,425**	**1727**	**38**	**123**
JH7LRS	**21**	**836,039**	**1711**	**37**	**144**
JH7XGN	**"**	**556,320**	**1277**	**37**	**123**
JA7XBG	*	492,692	1200	34	114
JR7XKN	*	263,875	813	30	95
JF7PHE	**A**	**455,607**	**746**	**90**	**189**
*JO7BBS	*	4,360	52	18	22
*JA7ARW	*	2,990	28	20	26
*JA7JHT	*	24	2	2	2
*JK7QYZ	28	11,834	103	21	40
*JE7DOT	*	5,978	55	21	28
*JL7AIA	*	2,204	31	15	23
*JF7GDF	21	1,387	40	9	10
*JH7IMX	14	4,018	38	16	25
JA8RWU	**A**	**699,815**	**804**	**117**	**218**
JA8TEZ	*	36,855	140	50	67
JH8UQJ	**28**	**84,337**	**303**	**35**	**86**
JA8CSY	**A**	**111,020**	**246**	**69**	**113**
*JK8HOS	*	525	16	11	10
*JI8BUR	21	22,494	140	24	45
*JH8AJB	*	21,924	142	21	42
*JK8FRL	*	20	5	3	2
JA9XBW	**A**	**376,130**	**501**	**95**	**195**
*JA9EJG	*	4,067	36	20	29
JA9JFO	**28**	**69,978**	**260**	**39**	**77**
JH9URT	**21**	**99,864**	**325**	**32**	**82**
*JA9SCB	*	6,357	74	15	24
*JH9VJW	7	154	8	6	8
JAØCCL	A	9,912	67	23	36
JAØQWO	*	5,400	48	22	23
JRØPJR	**28**	**35,148**	**161**	**25**	**62**
JAØBMS	**A**	**191,952**	**443**	**60**	**112**
*JHØSGG	*	16,720	74	34	54
JAØGEY	**28**	**14,805**	**109**	**20**	**43**
JJØJML	**21**	**126,152**	**487**	**29**	**75**
*JJØAEB	*	1,764	25	12	16
*JEØVFV	*	1,260	28	12	18
*JJØACA	*	18	2	1	2
JHØEPI	**14**	**129,387**	**368**	**34**	**95**

KAZAKHSTAN

UN6T	**A**	**1,141,402**	**1211**	**85**	**301**
UN6P	*	907,537	1025	108	281
UN9LW	*	362,151	917	37	116
UN7JJ	**28**	**538,572**	**1924**	**31**	**117**
UN9LY	**21**	**263,588**	**1047**	**31**	**106**
UN5PR	**A**	**317,967**	**584**	**92**	**171**
*UN4PG	*	55,110	141	43	124
*UN5J	*	12,717	73	30	51
UQ1D	**28**	**135,558**	**591**	**23**	**79**
				(Op: UN7DA)	
*UN7PBY	*	66,627	331	24	75
UN9LN	**14**	**294,224**	**871**	**33**	**115**
UN7JX	**"**	**258,279**	**797**	**37**	**110**

KOREA

HL3AMO	A	812	20	13	16
HL1/WX8C	**A**	**222,768**	**486**	**64**	**144**
HL5UOG	**"**	**170,128**	**380**	**67**	**150**

KUWAIT

9K9X	**A**	**9,194,824**	**4768**	**152**	**545**
				(Op: 9K2HN)	
9K2ZZ	**28**	**1,590,075**	**3623**	**40**	**151**
				(Op: N6BFM)	

KYRGYZSTAN

EX8O	**A**	**170,145**	**275**	**91**	**194**
EX7ML	**21**	**145,627**	**625**	**25**	**82**

MACAO

*XX9AU	21	3,976	119	12	16

MONGOLIA

JT1CO	**A**	**3,281,400**	**3748**	**126**	**324**
JT1DA	*	540,540	1449	80	180
JT1CN	*	292,488	1012	53	115
JT1BV	**A**	**1,791,355**	**2256**	**114**	**307**

OGASAWARA ISLANDS

*JD1BIA	A	6,720	185	15	20

OMAN

A45WD	**A**	**1,113,273**	**1134**	**105**	**254**
				(Op: YO9HP)	

PAKISTAN

*AP2AUM	A	159,728	416	44	105

SINGAPORE

9V1UV	**A**	**78,672**	**229**	**67**	**109**

TAIWAN

BV7FF	28	8,798	74	19	34
BV3BW	**21**	**304,969**	**1437**	**36**	**97**

TAJIKISTAN

EY8WW	**A**	**48,600**	**266**	**20**	**55**
EY7AV	**21**	**153,500**	**527**	**30**	**95**

THAILAND

HSØZDZ	**A**	**116,816**	**257**	**73**	**123**
*HS9EQY	A	8,580	62	22	43
HSØZDR	**21**	**94,750**	**317**	**32**	**93**
*HS4BPQ/9	*	8,400	107	20	28
*E2ØNTS	7	459	13	7	10

TURKMENISTAN

*EZ8CW	A	4,998	57	17	25

UZBEKISTAN

UK9AA	**21**	**919,975**	**2156**	**37**	**138**

VIETNAM

XV9DT	**A**	**598,230**	**927**	**90**	**216**
XV9TH	21	19,929	133	24	49

WEST MALAYSIA

9M2/G4ZFE	**21**	**332,856**	**1298**	**33**	**101**
9M2TO	**A**	**1,004,256**	**1814**	**96**	**256**

EUROPE

4U-VIENNA

4U1VIC	**21**	**785,880**	**2156**	**38**	**142**
				(Op: JH4RHF)	

ALAND ISLANDS

OHØXZ	**28**	**325,112**	**995**	**35**	**137**
				(Op: OH3XZ)	
OHØV	**21**	**736,194**	**2035**	**38**	**136**
				(Op: OH6LI)	
OHØNL	**7**	**242,496**	**1210**	**30**	**114**

ALBANIA

ZA/Z35M	**A**	**246,250**	**753**	**58**	**192**

AUSTRIA

OE8CIQ	**A**	**1,034,640**	**1429**	**104**	**328**
OE8YDQ	*	420,552	903	80	244
OE3WMW	*	249,120	739	36	108
OE3I	**28**	**382,564**	**1006**	**39**	**143**
				(Op: OE1JNB)	
OE4WWL	21	6,192	65	13	35
OE5CWL	7	4,944	78	12	36
OE6Z	**3.7**	**192,178**	**1409**	**21**	**89**
				(Op: OE6MBG)	
OE3JIS	**A**	**178,308**	**463**	**60**	**194**
OE6VIE	**"**	**171,477**	**447**	**65**	**196**
*OE1SOW	*	90,620	214	65	165
OE7AJT	**3.7**	**30,303**	**481**	**8**	**55**

BALEARIC ISLANDS

EA6LP	**A**	**600,134**	**1216**	**76**	**247**
EA6AZ	*	399,685	951	63	202
EC6TU	**A**	**9,512**	**80**	**27**	**55**
EA6DD	**28**	**501,084**	**1437**	**36**	**150**

BELARUS

EW2AA	**A**	**406,265**	**488**	**93**	**328**
EW8MW	**28**	**443,204**	**1197**	**34**	**145**
EW6AF	**21**	**155,379**	**738**	**34**	**113**
EW6GF	**14**	**96,778**	**769**	**25**	**81**
EW6MM	*	8,900	142	13	37
EW3LN	**3.7**	**48,133**	**361**	**32**	**95**
EU6EU	**1.8**	**49,876**	**709**	**11**	**63**
EU1SA	**A**	**724,825**	**1188**	**107**	**288**
*EU4LY	*	42,828	251	45	127
EU6TV	**28**	**53,295**	**239**	**21**	**74**
*EW1ABF	*	16,284	175	14	45
*EW6OO	*	2,232	32	15	21
EU2MM	**14**	**183,754**	**720**	**35**	**123**
*EW1GA	*	126,094	630	30	104
*EU1CC	*	75,258	488	27	84
*EW8OU	*	12,780	131	17	54
EU1AZ	**7**	**51,429**	**439**	**17**	**75**
*EW6AL	*	4,508	78	11	38

BELGIUM

ON4LG	**28**	**128,660**	**426**	**34**	**106**
OT2N	**21**	**300,000**	**958**	**33**	**127**
				(Op: ON6UQ)	
OT2Z	**"**	**258,648**	**910**	**31**	**125**
				(Op: ON4AMX)	
ON4CCP	**A**	**733,408**	**1281**	**73**	**271**
*ON9CKW	*	226,380	590	52	168
*ON6LY	*	113,810	298	48	142
*ON4XG	*	101,178	334	48	150
*ON6OM	*	49,290	150	53	106
*ON4CIN	*	6,408	65	24	48
*ON4KVA	*	5,406	56	18	33
*ON4LDP	28	29,106	177	18	45
ON4APU	**14**	**58,190**	**328**	**25**	**85**

BOSNIA-HERZEGOVINA

T94DO	**21**	**168,210**	**828**	**29**	**106**
*T95MMX	*	24,024	152	25	63
T94YT	**3.7**	**80,238**	**858**	**13**	**73**

BULGARIA

LZ1BJ	**A**	**423,792**	**733**	**75**	**252**
LZ9X	**28**	**802,780**	**2209**	**38**	**140**
				(Op: LZ1UK)	
LZ5Z	**21**	**283,500**	**1177**	**33**	**117**
				(Op: Todar)	
LZ9V	*	105,910	804	27	92
				(Op: LZ1WG)	
LZ3TL	**14**	**45,600**	**235**	**25**	**75**
LZ2BE	**A**	**322,240**	**714**	**75**	**245**
*LZ1DM	*	100,890	481	38	133
*LZ2UZ	*	97,882	392	56	162
*LZ1GU	*	84,630	177	63	132
*LZ3NY	*	60,465	237	37	108
*LZ4BU	*	5,376	45	21	27
*LZ1FJ	*	1,600	38	15	25
LZ1NG	**28**	**224,322**	**689**	**34**	**113**
*LZ2JA	*	80,678	446	30	77
*LZ3HI	*	28,124	176	26	53
LZ2FM	**21**	**24,273**	**208**	**21**	**66**
*LZ2L	*	12,489	105	19	50
				(Op: LZ2LDS)	
LZ2ZY	**14**	**107,956**	**549**	**29**	**108**
*LZ1EP	*	2,394	55	12	30
LZ2RF	**1.8**	**14,310**	**266**	**8**	**46**

CROATIA

9A2VR	**A**	**1,698,450**	**1526**	**115**	**392**
9A9A	**28**	**1,598,832**	**3123**	**40**	**176**
9A5W	**21**	**849,008**	**2313**	**37**	**151**
9A6A	**14**	**1,105,808**	**3082**	**38**	**168**
9A5E	**7**	**470,960**	**1981**	**32**	**113**
9A6K	*	184,760	993	26	98
9A8M	*	177,012	1113	23	85
9A1CCY	**3.7**	**114,480**	**1089**	**20**	**88**
				(Op: 9A5AGL)	
9A2EU	**A**	**2,531,504**	**1892**	**148**	**549**
*9A3AG	*	1,227,373	1480	104	365
*9A4SS	*	575,580	791	86	276
*9AØR	*	327,120	655	73	209
*9A2KL	*	234,299	404	80	189
*9A3ST	*	100,975	273	54	121
*9A6C	*	37,700	192	38	92
*9A3ZO	*	37,366	189	34	85
*9A5AVC	*	26,522	233	27	62
9A5KV	**28**	**448,414**	**1416**	**34**	**105**
*9A4VM	*	23,790	161	17	44
9A4VV	**21**	**81,302**	**591**	**24**	**82**
9A7ZZ	**14**	**119,322**	**585**	**29**	**97**
*9A4RV	*	80,240	464	27	91
*9A6PKT	7	2,442	67	5	32
*9A3QB	*	18	8	2	7

CZECH REPUBLIC

OK1EP	**A**	**1,242,000**	**1518**	**104**	**396**
OK1AXB	**"**	**810,152**	**1049**	**101**	**290**
OK2ABU	*	657,744	970	86	300
OK2EQ	*	428,892	771	81	266
OK1DXW	*	414,508	674	77	269
OK2PZ	*	254,560	609	67	229
OK1IBP	*	76,160	302	55	169
OK1DVK	*	76,109	216	62	125
OK1DXR	*	16,236	78	38	56
OK1OTP	**28**	**474,004**	**1423**	**34**	**129**
OL7N	**"**	**447,528**	**1207**	**38**	**136**
				(Op: OK1CDJ)	
OK2GG	*	197,659	612	34	117
OK1DUT	**21**	**102,843**	**418**	**28**	**89**
OK1RI	**14**	**1,098,240**	**2949**	**40**	**168**
OK1XC	*	97,720	464	30	110
OK1IE	7	19,920	154	17	63
OK1TP	**1.8**	**17,073**	**353**	**8**	**55**
OK1DWJ	*	2,860	46	7	45
OK2SG	*	2,730	74	5	34
OKØZV	**A**	**1,570,568**	**1602**	**118**	**430**
OK2WTM	**"**	**1,163,616**	**1448**	**123**	**404**
OK1DCF	**"**	**1,022,626**	**1346**	**98**	**375**
*OK1VD	*	775,062	995	101	362
*OK2MBP	*	699,176	1060	77	311
*OK1FJD	*	575,271	903	84	285
*OK2SGY	*	483,735	892	80	277
*OK1CYC	*	454,080	786	72	258
*OK1VVW	*	331,110	756	58	225
*OK2HBR	*	306,246	565	73	185
*OK1TC	*	295,818	595	70	212
*OK2FB	*	282,561	573	70	221
*OK1VBA	*	264,320	565	71	209
*OK2BEN	*	229,796	595	63	220
*OK1NR	*	209,125	526	56	183
*OK1CJN	*	191,360	395	62	168
*OK1MKI	*	172,120	564	59	201
*OK1AOV	*	140,892	354	62	174
*OK2DU	*	129,340	428	54	169
*OK1HGM	*	122,496	338	52	140
*OK2BRX	*	106,603	382	42	115
*OK2TBC	*	104,404	299	53	119
*OK1SMU	*	91,980	469	32	114
*OK2PHC	*	91,950	353	35	115
*OK1DSX	*	90,828	340	42	132
*OK1WWJ	*	61,620	221	50	145
*OK2PHI	*	59,340	231	34	81
*OK1AVY	*	49,680	188	46	92
*OK1AOU	*	36,120	176	39	101
*OK1BA	*	31,779	113	46	61
*OK1FCA	*	30,870	208	31	95
*OK1DOL	*	29,591	147	38	89
*OK1FFH	*	28,254	166	32	70
*OK1SRD	*	27,946	186	38	119
*OK1DTC	*	24,961	108	41	68
*OK2PEF	*	20,475	143	30	75
*OK2BND	*	9,163	72	26	51
*OK1KEL	*	1,836	66	10	24
			(Op: OK1CBB)		
OK1KDT	**28**	**239,872**	**759**	**31**	**97**
				(Op: Pavel)	
*OK1ARI	*	89,056	337	31	90
OK1TN	**21**	**361,916**	**938**	**38**	**135**
*OK2FNG	*	150,655	533	31	114
*OK1TRM	*	59,622	299	28	86
*OK1MMN	*	14,579	113	17	44
*OK2BEM	*	7,102	62	20	47
*OK1CAZ	14	10,176	132	17	47
*OK2BWC	*	1,836	125	9	42
*OK2SWD	*	336	10	6	8
OK1KT	**7**	**18,122**	**174**	**16**	**66**
*OK1TGI	*	13,735	222	11	56
*OK2TCW	*	700	24	7	18
OK2HI	**3.7**	**39,120**	**530**	**13**	**67**
*OK1FPS	*	36,660	549	12	53
*OK1MAL	*	9,964	194	8	45

DENMARK

OZ1HXQ	**A**	**1,893,000**	**2184**	**109**	**391**
OZ1DD	*	501,858	1038	70	224
OZ5EV	*	361,444	463	100	336
OZ4RT	*	16,926	87	32	59
OZ8EA	28	7,847	87	16	43
OZ3SK	**1.8**	**56,092**	**779**	**11**	**63**
OZ1ACB	**A**	**411,693**	**734**	**68**	**259**
*OZ4NA	*	227,942	565	58	228
*OZ5LH	*	124,620	359	52	149
*OZ6EI	*	20,585	159	30	85

DODECANESE

SV5AZP	**A**	**459,036**	**2271**	**34**	**130**
SV5/SV1DKL	**A**	**302,680**	**1023**	**59**	**176**
SV5/GØHAS	**28**	**235,175**	**1477**	**24**	**91**

ENGLAND

G4BUO	**A**	**3,517,632**	**2789**	**123**	**435**
M6T	**"**	**2,795,578**	**2780**	**112**	**387**
				(Op: G4PIQ)	
M5D	*	1,205,848	1472	108	360
				(Op: G3NAS)	
G3ZXO	*	256,686	717	49	190
G4F	**28**	**553,248**	**1547**	**33**	**120**
				(Op: G4DHF)	
M7Z	**21**	**606,550**	**1723**	**38**	**137**
				(Op: G3VHB)	
G4Z	**14**	**276,908**	**1197**	**35**	**113**
				(Op: G4DEZ)	
M2Z	*	48,450	309	20	82
				(Op: M5RIC)	
G3TVU	*	42,372	332	21	78
***G4IIY**	**A**	**843,228**	**1182**	**80**	**317**
***GØMTN**	**"**	**746,850**	**1139**	**77**	**306**
*M5FUN	*	319,275	775	64	233
*G3KKP	*	197,160	492	51	161
*G4GOY	*	181,440	516	52	172
*G4NXG	*	154,037	355	60	161
*MØBZK	*	148,980	426	47	144
*M5UGC	*	137,280	364	52	156
*MØOOT	*	131,868	379	51	171
*GØ/N9LYE	*	119,992	409	47	165
*GØMRH	*	79,285	355	36	121
*MØAFZ	*	48,825	267	46	129
*G4SLE	*	14,760	116	25	57
*MØZAK	*	7,128	68	24	42
*M3ANB	*	100	7	4	6
***GØAEV**	**28**	**379,953**	**941**	**33**	**130**
*G3PJV	*	181,233	756	27	90
*MØAQM	*	23,100	182	18	42
*GØICJ	*	4,640	81	13	27
***GØEYO**	**21**	**40,629**	**292**	**20**	**67**
***MØLSK**	**14**	**93,599**	**454**	**27**	**100**
*MØGEB	*	49,504	379	18	73
*M4T	*	7,056	102	10	39
				(Op: GØVQR)	
***G3UEG**	**1.8**	**24,366**	**431**	**8**	**54**

ESTONIA

ES1AJ	**A**	**1,425,008**	**1989**	**112**	**415**
ES1QD	*	61,420	149	58	108
ES2X	**28**	**299,280**	**938**	**35**	**139**
				(Op: ES2NA)	
ES6CO	*	83,295	292	31	104
ES5GI	**14**	**244,881**	**1013**	**37**	**124**
***ES4RD**	**A**	**27,258**	**162**	**31**	**87**
***ES4RC**	**28**	**27,048**	**142**	**22**	**70**
*ES5TX	*	20,750	103	22	61
*ES1OX	*	8,875	60	23	48
***ES1CN**	**21**	**39,102**	**229**	**22**	**76**

EUROPEAN RUSSIA

RM4W	**A**	**3,742,992**	**2864**	**136**	**476**
				(Op: RW4WR)	

*RN6FK	*	28,520	148	45	110
*RW3SU	*	28,274	157	36	98
*RX3DTN	*	24,420	94	35	75
*RU3XB	*	20,330	137	31	76
*UA4AVN	*	17,978	167	23	78
*RU4WE	*	8,073	84	20	49
*RA3BT	*	8,060	62	17	48
*RA3MB	*	7,055	60	31	54
*RA3VGD	*	6,887	46	31	40
*RV6ASU	*	6,104	42	20	36
*RZ3TZA	*	2,106	23	19	20
*RU4LM	*	168	9	5	9
***RV3ACA**	**28**	**221,728**	**726**	**34**	**130**
*UA4PAN	*	109,752	534	30	106
*UA4CC	*	88,138	315	30	97
*RU3DD	*	30,498	135	26	76
*RV3DCC	*	30,282	172	20	78
*RA1QDP	*	11,690	122	18	52
*RW3AFY	*	3,198	31	13	28
***RU6FA**	**21**	**171,912**	**671**	**35**	**121**
*UA1ANA	*	97,110	485	30	100
*RA3DNC	*	82,320	410	27	93
*RW4FX	*	35,581	232	23	68
*UA4ACP	*	25,116	192	20	64
*RW4LQ	*	8,340	52	21	39
***RA6CT**	**14**	**114,660**	**579**	**26**	**100**
*RX3AAJ	*	86,374	303	33	110
*RV3YR	*	59,276	340	28	88
*RW6HW	*	11,704	117	26	62
*UA4FX	7	165	16	6	9
***RW6AH**	**3.7**	**15,232**	**223**	**9**	**55**
*UA3LBE	*	1,504	55	5	27
*RK6AIQ	1.8	630	36	6	15
*RW3DY	*	616	24	6	16

EUROPEAN TURKEY

***TA1FA**	**A**	**456,672**	**1281**	**66**	**202**
***TA1/DL4ZBC**	**"**	**334,951**	**909**	**62**	**227**
*TA1AL	*	84,240	281	69	165
***TA1EJ**	**28**	**36,036**	**254**	**20**	**57**
***TA1EQ**	**"**	**28,908**	**393**	**19**	**47**
***TA1EM**	**21**	**17,280**	**289**	**19**	**53**
***TA1DX**	**14**	**58,760**	**389**	**23**	**90**
***TA1BM**	**7**	**30,627**	**316**	**16**	**67**
***TA1ED**	**"**	**23,244**	**291**	**13**	**65**
*TA1GS	*	17,355	224	10	55

FINLAND

OH2RA	**A**	**2,870,174**	**2796**	**133**	**430**
OH5NE	*	352,512	976	59	247
OH8L	*	237,861	647	60	111
			(Op: OH8LQ)		
OH4RH	*	222,155	555	66	217
OH3JR	*	219,333	415	76	263
OH1TV	*	170,375	315	77	158
OH1BOI	*	160,440	411	63	217
OH2K	*	100,498	261	54	164
			(Op: OH2LRE)		
OH2CI	*	19,153	129	28	79
OH5NQ	**28**	**343,352**	**1047**	**35**	**132**
OH3RR	*	153,120	463	32	128
OH2XF	*	53,728	177	33	113
OH7C	**21**	**656,110**	**1707**	**38**	**144**
			(Op: OH7HDU)		
OH1F	**"**	**631,304**	**1624**	**38**	**146**
			(Op: OH1MDR)		
OH2BH	**14**	**916,943**	**2418**	**39**	**154**
			(Op: OH2IW)		
OH3UU	**7**	**67,084**	**387**	**39**	**94**
OH2BP	**"**	**54,158**	**491**	**26**	**85**
OH1BV	*	19,890	204	18	60
OH7A	**3.7**	**16,492**	**261**	**14**	**62**
			(Op: OH7UE)		
***OH1KF**	**A**	**537,005**	**603**	**100**	**369**
*OH2LU	*	146,862	344	63	183
*OH1TD	*	108,676	418	44	158
*OH2MO	*	83,628	291	55	152
*OH2HXP	*	67,522	325	45	137
*OH7TO	*	64,844	325	45	127
*OH4YT	*	41,600	176	42	88
*OH1AL	*	35,178	237	37	106
*OH2JLN	*	15,444	129	22	77
*OH3AD	*	5,576	93	16	52
*OH7GIG	*	3,540	50	18	42
***OH1LEG**	**28**	**193,952**	**502**	**36**	**140**
*OH5NZ	*	89,598	272	31	106
*OH2BNX	*	31,977	150	24	75
*OH6RC	*	24,347	115	27	70
***OH6OS**	**21**	**221,616**	**822**	**32**	**120**
*OH2BCD	*	57,596	366	33	86
*OH5BQ	*	13,552	127	20	57
*OH6IU	14	2,444	36	21	31

FRANCE

F2JD	**A**	**2,259,252**	**2211**	**113**	**400**
F6DZU	**"**	**1,057,320**	**1685**	**83**	**214**
F5BBD	*	897,748	1473	88	324
F6FYD	*	783,835	1252	86	303
F5RAB	*	615,980	895	83	297
F2AR	*	392,235	691	74	257
F5JFU	*	158,006	343	57	142
F5CQ	*	122,765	292	56	159
F8CNR	*	37,840	198	23	57
TM9R	**21**	**1,029,888**	**2615**	**39**	**153**
			(Op: F5FNL)		
TM7XX	**"**	**1,001,222**	**2339**	**39**	**152**
			(Op: F5MUX)		
TM9T	*	559,776	1764	36	132
			(Op: F6HMQ)		
***F5NZO**	**A**	**1,187,581**	**1374**	**104**	**363**
***F6FTB**	**"**	**746,970**	**1037**	**86**	**304**
*F5RRS	*	714,480	1086	80	232
*F5POJ	*	496,170	817	73	225
*F6DZD	*	469,084	792	72	236
*F5KLE	*	113,552	334	50	138
			(Op: F5JNT)		
*F8CFE	*	88,724	314	40	124
*F5PVJ	*	85,470	351	39	146
*F5MMX	*	77,433	317	37	122
*F2RO	*	74,664	284	37	116
*F5SGI	*	68,400	253	41	103
*F8DFN	*	64,320	307	36	124
*F5OHH	*	52,416	259	37	119
*F5TYY	*	46,008	227	30	78
*TM5SIA	*	7,524	91	19	57
			(Op: F5NQL)		
*F5RPB	*	2,223	32	13	26
***F8AAN**	**28**	**311,328**	**979**	**32**	**112**
*F8BJI	*	130,816	374	34	112
*F5AJG	*	62,177	294	24	73
*F6CLM	*	2,720	43	13	21
*F5TMJ	*	1,326	33	8	18
***F5DRD**	**21**	**128,500**	**600**	**27**	**98**
*F5JY	*	116,229	494	30	99

GERMANY

DH1TW	**A**	**3,126,708**	**2632**	**135**	**477**
DL4NAC	**"**	**3,017,131**	**2166**	**137**	**552**
DJ4PT	**"**	**1,706,068**	**1739**	**104**	**332**
DL7ANR	*	1,454,843	1521	106	387
DJ3HJ	*	1,326,792	1260	109	363
DF9XV	*	1,045,657	1174	115	364
DL4WA	*	572,084	930	81	277
DL2APJ	*	528,450	791	86	304
DJ1TU	*	497,520	698	87	273
DL6UNF	*	437,835	746	68	221
DL1PT	*	301,126	617	68	206
DL4SKF	*	296,724	614	64	173
DL3JPN	*	287,806	494	73	229
DL3SKF	*	281,112	628	60	144
DJØIF	*	236,900	524	63	167
DL3BRC	*	235,912	490	69	227
DL8AAE	*	212,667	391	74	199
DAØED	*	203,574	487	52	170
			(Op: DL4YAO)		
DL6RBH	*	176,440	448	63	157
DL1DTC	*	168,756	292	80	207
DL6KAC	*	127,575	359	46	129
DL8YR	*	124,558	385	52	165
DK7DN	*	118,846	377	47	135
DK4LI	*	110,908	286	59	174
DH1DA	*	97,412	257	52	144
DK4RL	*	72,631	198	51	100
DH3MAY	*	55,650	240	45	130
DL6NCY	*	50,880	166	44	115
DL3YA	*	37,914	187	41	101
DL3DBY	*	36,542	160	35	86
DF6WE	*	30,972	165	32	84
DL3LAB	*	22,791	115	33	74
DL1YFF	*	17,856	107	28	44
DH6AB	*	14,933	150	25	84
DL5ANS	*	6,215	51	19	36
DJ3DM	*	2,585	48	22	33
DL1YCF	*	2,052	30	16	20
DFØWA	**28**	**832,020**	**1914**	**37**	**159**
			(Op: DL2MEH)		
DF7IT	*	311,190	838	35	130
DF1JM	*	184,258	499	38	143
DJ6GK	*	148,610	442	33	121
DL7FER	**21**	**248,013**	**811**	**32**	**121**
DJ1AA	*	57,528	335	24	78
DJ1CW	**14**	**269,745**	**1062**	**34**	**113**
DF1PAW	*	36	3	2	2
DL5NAM	**3.7**	**15,424**	**241**	**10**	**54**
DK9IP	**1.8**	**30,015**	**501**	**9**	**60**
DL5SVB	*	700	34	5	20
***DL4MCF**	**A**	**2,195,445**	**1908**	**118**	**491**
***DF3KV**	**"**	**1,508,596**	**1500**	**110**	**414**
***DL1XX**	**"**	**792,000**	**1085**	**75**	**277**
*DH8AF	*	762,543	1050	93	346
*DL3EA	*	758,408	797	105	362
*DJ8UV	*	751,548	1489	84	305
*DL6GV	*	629,536	849	95	317
*DK3KD	*	570,141	977	83	346
*DL2VB	*	515,529	790	77	266
*DJ4JF	*	514,520	643	91	289
*DL7UXG	*	503,815	815	75	262
*DM5JBN	*	500,656	739	80	252
*DL8NBJ	*	354,036	705	64	262
*DH5AO	*	335,846	688	67	231
*DL8ULO	*	324,792	649	69	243
*DK3WN	*	323,046	694	60	214
*DL8SDC	*	321,480	676	62	173
*DF3QG	*	309,420	504	81	243
*DL1MAJ	*	304,810	436	75	251
*DL8HCO	*	292,152	599	71	258
*DH2MA	*	275,096	623	67	207
*DL2FDL	*	266,070	653	72	222
*DL1FZZ	*	239,610	387	72	222
*DF3AX	*	225,750	545	59	191
*DL8EAD	*	215,280	511	58	182
*DL4GBA	*	212,850	454	66	192
*DL4RCK	*	200,610	481	65	205
*DJ2IE	*	195,684	453	68	208
*DL3ZAI	*	184,414	452	53	158
*DK5WO	*	177,285	451	55	168
*DH9KR	*	170,628	479	46	190
*DH5WB	*	159,123	473	47	130
*DK5DS	*	147,408	459	49	173
*DL1BWU	*	142,870	374	42	140
*DL6DVU	*	141,949	419	64	177
*DM2AWM	*	139,536	435	49	167
*DJ3GE	*	127,870	342	49	141
*DK7FP	*	114,558	328	54	129
*DL9GTB	*	113,477	274	49	154
*DL6ZNG	*	108,800	313	56	144
*DL3SR	*	100,276	341	47	125
*DK6AY	*	98,112	345	41	127
*DK6QW	*	91,630	253	50	120
*DL1DBR	*	89,380	272	53	152
*DL4JYT	*	81,780	244	61	174
*DK6BT	*	81,700	254	50	140
*DF6LQ	*	73,616	253	48	124
*DJ3JD	*	67,606	206	43	111
*DL2AL	*	63,063	205	38	105
*DL9JON	*	62,266	167	54	137
*DF1IAV	*	48,160	206	32	80
*DJ5IR	*	41,748	257	33	114
*DL8MUG	*	38,212	161	28	54
*DL2YET	*	37,995	203	37	112
*DL8LDN	*	37,335	173	40	91
*DL3KDC	*	29,750	221	26	99
*DL8DXL	*	26,332	129	34	82
*DN1HGW	*	25,984	185	31	81
*DM3XI	*	23,836	101	26	75
*DL8UNF	*	23,322	178	47	91
*DJ1AD	*	22,780	142	37	97
*DL4GBR	*	20,657	152	24	67
*DL1KAS	*	18,224	229	30	106
*DH7AMF	*	17,876	121	34	75
*DK7MCX	*	17,710	136	31	79
*DL2MIH	*	16,192	78	34	58
*DF1HF	*	15,520	83	33	64
*DL2KWW	*	13,986	80	27	47
*DF3IS	*	13,659	108	25	62
*DL8SDI	*	9,548	84	29	48
*DK5NAD	*	8,890	78	23	47
*DL3SCN	*	8,832	89	21	43
*DL8UGF	*	8,512	62	27	49
*DL5RBR	*	6,840	95	12	60
*DL7MAT	*	2,880	32	17	28
*DN3ASB	*	2,691	28	17	22
*DL7VRG	*	1,656	29	12	24
*DL8JDX	*	1,488	20	13	18
***DF7YU**	**28**	**350,704**	**827**	**36**	**148**
*DJ2XC	*	104,312	381	30	106
*DL8UAT	*	90,270	321	24	94
*DL1TS	*	42,849	230	23	58
*DL2QT	*	35,156	201	22	46
*DL3DRN	*	32,305	144	23	68
*DL8ZAJ	*	13,872	112	16	35
*DL1FMG	*	9,000	107	14	31
*DL2DRD	*	6,265	66	13	22
*DK3YD	*	5,724	63	12	24
*DJ6XB	*	5,130	61	13	17
***DL2DBH**	**21**	**274,205**	**786**	**38**	**135**
*DL3BRA	*	95,232	403	29	99
*DK4VH	7	4,182	91	8	43
*DLØMLU	*	196	16	2	12
***DH6LS**	**3.7**	**56,050**	**570**	**17**	**78**
*DF9MV	*	13,608	231	8	48
*DL2RZG	1.8	972	40	4	23

GREECE

SV1DKR	**7**	**119,462**	**806**	**22**	**84**
***SV1DPI**	**A**	**391,424**	**799**	**67**	**211**
***SV1DZB**	**14**	**58,734**	**497**	**27**	**90**

GUERNSEY

***MUØFAL**	**28**	**52,599**	**249**	**20**	**69**

HUNGARY

HA8JV	**A**	**4,998,371**	**4173**	**141**	**532**
HAØHW	*	1,016,960	1218	103	345
HA9SU	**28**	**415,856**	**1050**	**36**	**122**
HA8UH	*	100	46	10	19
HG9X	**14**	**604,440**	**1904**	**38**	**142**
			(Op: HA9PP)		
HA3LN	*	179,316	905	32	121
***HA1CW**	**A**	**2,255,082**	**2309**	**126**	**492**
*HA8IC	*	363,273	702	69	220
*HA3LI	*	241,230	321	84	246
*HA6IAM	*	118,465	421	53	162
***HA8QB**	**28**	**62,400**	**278**	**27**	**73**
*HA3FT	*	7,552	125	17	42
***HA8BE**	**1.8**	**40,460**	**585**	**9**	**61**

ICELAND

***TF8GX**	**A**	**271,908**	**521**	**65**	**184**
***TF3MA**	**21**	**34,100**	**162**	**23**	**77**

IRELAND

EI4DW	**A**	**1,123,892**	**1462**	**74**	**282**
EI4BZ	*	380,016	632	65	247
EI3JE	**28**	**692,958**	**2155**	**34**	**113**
EI8GS	**21**	**506,850**	**1808**	**33**	**122**
EI5GM	**7**	**41,349**	**490**	**13**	**64**
EI8IR	**3.7**	**159,965**	**1203**	**21**	**86**
***EI6HB**	**A**	**155,295**	**368**	**50**	**153**
*EI2CH	*	108,564	380	44	122
*EI9ES	*	98,638	285	46	103
***EI5DI**	**28**	**54,360**	**300**	**18**	**72**
***EI4CF**	**21**	**181,916**	**786**	**30**	**116**
***EI2CA**	**7**	**16,756**	**188**	**13**	**58**

ISLE OF MAN

GD6IA	**A**	**6,090,309**	**4461**	**124**	**515**
			(Op: GM3WOJ)		
***GD4GWO**	**A**	**50,544**	**254**	**38**	**124**

ITALY

IK4ADE	**A**	**3,182,172**	**2988**	**116**	**400**
IZ4COW	**"**	**2,242,900**	**2068**	**118**	**432**
IO2C	**"**	**1,659,370**	**1883**	**104**	**350**
			(Op: IK2WZV)		
IZ8DPL	*	1,446,640	1974	83	255
IZ1EGV	*	566,390	844	83	335
IK1YMF	*	347,913	606	71	208
IK8TMI	*	309,600	568	83	175
IZ4EKI	*	67,093	368	43	126
IZ7EVZ	*	63,568	388	76	156
IV3MGN	*	13,973	93	30	59
IZ1AOD	*	1,521	30	12	27
IK4AUY	**28**	**456,544**	**1014**	**36**	**140**
IR4R	*	257,415	897	33	98
			(Op: IK4ALM)		
IZØBEE	*	155,013	488	34	129
IO2L	*	154,845	442	32	123
			(Op: I2OKW)		
IZ5ASZ	*	92,058	302	33	101
IY4W	**21**	**985,136**	**2488**	**37**	**147**
			(Op: I4LEC)		
IU2P	**"**	**837,726**	**1983**	**39**	**152**
			(Op: I2PJA)		
IR6W	**14**	**470,844**	**1783**	**34**	**130**
			(Op: IK6SNQ)		
IV3OWC	**7**	**109,600**	**919**	**29**	**108**
IK4ALM	*	5,952	96	12	19
I4AVG	**3.7**	**133,533**	**926**	**19**	**92**
***IO4C**	**A**	**2,379,776**	**2349**	**128**	**453**
			(Op: IZ4DPV)		
***IQ8A**	**"**	**1,431,612**	**2074**	**111**	**357**
			(Op: IK8NWK)		
***IZ8EFI**	**"**	**826,160**	**1078**	**100**	**349**
*IZ8DBJ	*	574,232	1209	84	274
*IK2UCK	*	366,744	647	73	223
*IK7RVY	*	307,145	693	58	177
*IN3FHE	*	254,340	550	55	215
*IK2ULM	*	251,034	495	61	197
*IO4I	*	239,141	510	61	208
			(Op: IK4QIB)		
*IN3HDE	*	232,050	585	55	183
*IV3SDE	*	220,088	456	63	181
*IK8WEI	*	205,200	521	48	142
*IZ8DFO	*	173,430	406	62	184
*IZØEHL	*	165,807	524	48	159
*IZ2EEQ	*	134,400	304	56	136
*IK7WPD	*	114,176	271	61	162
*IV3WMS	*	111,882	275	57	117
*IK2ULV	*	104,575	245	76	159
*IZ1ANK	*	103,194	634	65	208
*IK2WXQ	*	101,606	406	45	157
*IK5LWE	*	97,572	249	49	124
*IZ2ABN	*	96,136	201	70	127
*IZ1ANZ	*	94,710	333	46	119
*IZ4AQL	*	94,163	274	49	142
*IK2YSJ	*	89,300	315	53	137
*IK5ZTT	*	60,648	285	41	111
*I8TWB	*	54,600	202	47	109
*IZ7EVR	*	48,440	202	43	97
*IK5YJK	*	47,580	199	37	85
*IZ2EID	*	43,092	197	37	96
*IK3OII	*	37,812	159	38	54
*IK2WFN	*	31,815	143	38	67
*IK8IFW	*	30,552	220	41	111
*IK7WUE	*	29,252	161	34	69
*IK8MVB	*	25,585	165	35	84
*IK8NRW	*	19,950	92	39	66
*IZ3DBE	*	19,206	161	29	70
*IZØCEY	*	12,586	86	27	35
*IZ1DBY	*	10,908	94	29	72
*IK7UKJ	*	10,168	91	29	53
*IK7YZF	*	6,052	73	22	46
*IK2WYI	*	5,301	62	15	16
*IV3BKH	*	5,040	53	18	22
*IZ1DLY	*	4,300	55	18	25
*IZ8DGR	*	2,616	41	11	13
*IZ4AIF	*	990	20	16	17
*IK2EBP	*	391	16	7	10
***IZ5CML**	**28**	**381,140**	**917**	**37**	**133**
***I8UZA**	**"**	**319,701**	**810**	**38**	**145**
*IZ4DJZ	*	266,490	815	35	100
*IZ5EBL	*	226,734	679	37	122
*IK2YGZ	*	149,640	593	28	92
*IZ4DYP	*	93,195	353	29	80
*IZ7DOK	*	76,450	350	29	81
*IK4QJM	*	67,260	347	25	70
*IZ8CCW	*	64,600	611	32	104
*I1ZHH	*	46,662	204	25	76
*IQ8Y	*	33,891	201	21	58
			(Op: IZ8CLM)		
*IK2WZQ	*	27,560	149	21	44
*IK2OLJ	*	14,539	116	22	45
*IV3KSE	*	1,656	25	10	14
*IZ4DIT	21	11,072	113	19	45
***IK3UMT**	**14**	**217,626**	**781**	**38**	**128**
*IZ8BGY	*	64,890	553	21	82
***IK1SPR**	**3.7**	**19,809**	**254**	**9**	**62**

KALININGRAD

UA2CZ	**A**	**260,652**	**530**	**79**	**242**

LATVIA

YL2KO	**A**	**2,542,400**	**2349**	**121**	**439**
YL2SM	**"**	**2,030,952**	**2020**	**130**	**409**
YL6W	*	846,872	1065	109	333
			(Op: YL2GD)		
YL2TW	*	544,305	994	93	300
YL2PA	*	182,784	569	55	217
***YL2SW**	**A**	**446,472**	**842**	**80**	**238**
***YL2GN**	**"**	**401,265**	**782**	**77**	**256**
*YL2IP	*	66,240	189	51	141
*YL2CR	*	55,224	303	33	123
*YL2PP	*	37,960	120	44	102
***YL2GTS**	**28**	**59,840**	**250**	**27**	**83**
*YL2MF	*	12,261	105	18	43
***YL2BJ**	**14**	**51,615**	**395**	**19**	**74**
***YL1ZJ**	**3.7**	**10,584**	**205**	**9**	**47**

LITHUANIA

LY2MM	**A**	**938,432**	**1165**	**101**	**372**
LY1CX	**"**	**844,488**	**1009**	**95**	**349**
LY2OX	*	530,796	724	102	324
LY2OO	*	94,738	413	45	157
LY3BU	*	66,177	300	42	129
LY2OU	**28**	**227,200**	**732**	**34**	**126**
LY3BH	*	60,822	318	31	78
LY1DT	**21**	**147,024**	**644**	**31**	**113**
LY2MW	**14**	**543,200**	**1813**	**38**	**137**
LY5A	**7**	**404,337**	**1770**	**33**	**126**
			(Op: LY2PX)		
LY2HM	**1.8**	**42,813**	**677**	**9**	**58**
***LY7Z**	**A**	**3,278,436**	**2602**	**139**	**512**
			(Op: LY2TA)		
***LY9A**	**"**	**2,181,438**	**2128**	**128**	**481**
			(Op: LY3BA)		
***LY6A**	**"**	**1,069,552**	**1308**	**100**	**372**
			(Op: LY2BM)		
*LY3BX	*	881,238	1186	91	295
*LY2DX	*	279,524	708	67	231
*LY2FN	*	97,890	309	52	143
*LY3CY	*	95,040	302	48	132
*LY2BOK	*	51,483	380	30	101
*LY1BX	*	34,717	180	43	106
*LY2QJ	*	12,825	123	20	55
*LY2BET	*	9,086	99	16	43
***LY2DM**	**28**	**110,617**	**396**	**27**	**100**
*LY2OM	*	41,440	182	25	87
*LY2EC	*	40,170	208	26	77
*LY2AT	*	19,275	133	22	53
*LY3KB	*	1,891	31	8	23
***LY2TE**	**14**	**94,248**	**522**	**26**	**100**
*LY3GJ	*	3,200	124	12	38
*LY2LF	*	1,484	39	9	19
*LY1DS	*	540	15	8	12
***LY2OW**	**3.7**	**35,428**	**515**	**9**	**59**
***LY3UM**	**1.8**	**26,050**	**402**	**9**	**57**

LUXEMBOURG

LX7I	**A**	**2,642,674**	**2530**	**129**	**458**
			(Op: LX2AJ)		
LX1KC	**7**	**206,718**	**1220**	**28**	**103**
LX9SW	*	62,350	698	17	69
			(Op: LX1RQ)		
***LX1JC**	**A**	**182,546**	**455**	**53**	**185**

MACEDONIA

Z31GX	**28**	**800,640**	**2087**	**38**	**142**
Z33AA	**14**	**527,040**	**2070**	**39**	**141**
***Z36W**	**A**	**1,980,690**	**2393**	**108**	**407**
*Z32XX	*	805,438	1490	63	194
***Z31B**	**21**	**190,800**	**817**	**32**	**118**
*Z35G	*	49,755	308	24	83

MOLDOVA

ERØND	**A**	**1,940,022**	**1963**	**129**	**390**
			(Op: UT7ND)		
ER5DX	*	1,384,617	1727	106	401
ER1QQ	**28**	**216,000**	**782**	**34**	**116**
***ER3CT**	**A**	**228,724**	**641**	**63**	**208**
*ER1BF	*	34,181	159	37	96
*ER1MF	*	28,245	151	30	75
*ER3CAB	*	21,528	220	27	77
***ER1OM**	**28**	**36,565**	**166**	**29**	**74**
*ER1FF	*	15,257	113	23	50

MONACO

3A2MG	**A**	**204,282**	**360**	**77**	**214**

NETHERLANDS

PAØIJM	**A**	**770,044**	**1366**	**87**	**320**
PAØJNH	**"**	**518,814**	**913**	**75**	**294**
PA3BWD	*	54,526	212	40	97
***PAØAGA**	**A**	**964,404**	**1786**	**80**	**276**
***PA3EMN**	**"**	**585,024**	**993**	**74**	**278**
*PA3FNE	*	358,048	689	70	264
*PA3FGJ	*	210,132	541	49	185
*PAØLSK	*	194,310	468	56	199
*PAØRBS	*	91,776	333	42	150
*PA8MO	*	63,921	235	47	102
*PA1PAT	*	63,008	273	45	131
*PA3GGW	*	26,026	181	37	117
*PA3CDN	*	25,760	189	38	122
*PA2ALF	*	25,536	135	33	81
*PAØNMH	*	5,688	70	22	50
*PA3HGF	*	2,236	35	12	14
***PAØMIR**	**28**	**112,903**	**380**	**27**	**100**
*PA9KW	*	28,246	210	16	42
*PA/ZS6IR	*	25,420	168	22	60
***PAØJED**	**21**	**62,160**	**322**	**25**	**87**
*PA3ADJ	*	18,104	134	19	54
***PA1TT**	**7**	**38,335**	**422**	**16**	**69**
*PA3DOQ	1.8	21	6	2	5

NORTHERN IRELAND

***GIØKVQ**	**A**	**615,450**	**1002**	**63**	**212**
*MI5AFL	*	45,832	206	40	96
*GIØVTS	*	41,905	205	36	109
*GIØOUM	*	40,610	214	33	98
*GI4JTF	*	22,600	121	38	75
*GI4AAM	*	17,480	172	24	71
*MIØAE

*SP6NVK	*	66,805	310	41	114
*SP1KV	*	57,276	133	53	119
*SP9GFI	*	56,615	196	52	117
*SQ7FSM	*	55,263	254	45	124
*SP5FCS	*	54,418	256	38	123
*SP7VCA	*	51,150	205	44	106
*SP5ZIC	*	50,024	236	43	105
*SQ9DXN	*	41,160	131	44	103
*SP8EEX	*	36,828	145	39	69
*SQ9ITM	*	29,784	116	45	91
*SP9OYT	*	28,416	203	30	81
*SP8TDE	*	25,080	97	49	83
*SP7LHX	*	19,493	127	34	67
*SP6DHH	*	18,810	174	26	69
*SP3UIW	*	17,480	89	33	59
*SP3FVV	*	13,590	141	21	69
*SP4JTJ	*	11,968	89	33	55
*SP4AUN	*	8,260	97	22	48
*SQ6IUD	*	5,394	84	27	60
*SP1DOT	*	4,278	56	20	42
*SP6FIB	*	3,723	41	21	30
*SQ4CTS	*	2,928	37	16	32
*SP5CGN	*	2,266	31	14	22
*SP9IKN	*	2,257	65	20	41
*SP6GNJ	*	176	6	5	6
*SP1EGN	*	96	4	4	4
***SP9FJA**	**28**	**160,147**	**618**	**30**	**97**
*SQ6ELV	*	93,744	360	31	81
*SP1DPA	*	76,191	296	23	86
*SP9EML	*	65,382	265	29	73
*SP5EWX	*	62,124	243	31	93
*SP4DC	*	57,873	250	22	79
*SP2HXY	*	20,100	152	20	47
*SQ9NRF	*	17,319	142	20	49
*SP4DZT	*	4,136	37	17	30
*SQ8JLF	*	1,560	45	9	15
***SN2X**	**21**	**210,336**	**668**	**36**	**132**
			(Op: SP2DWG)		
***SP9XCN**	**"**	**193,050**	**647**	**34**	**116**
*SP5AKG	*	65,024	258	26	101
*SP2JLR	*	63,845	337	28	85
*SQ9AOR	*	45,312	286	23	73
*SP7ENU	*	8,800	107	14	41
***SP9EWO**	**14**	**127,302**	**550**	**31**	**116**
*SP3GHK	*	33,026	273	19	79
*SQ2EAN	*	30,394	273	19	72
*SP3BJK	*	28,600	235	18	70
*SP8GNF	*	18,720	201	18	72
*SP8DOB	*	13,969	213	10	51
*SP9BMH	*	8,294	133	9	49
*SP4BPH	*	6,903	96	10	49
*SQ8LEC	*	957	39	6	23
*SP9PTG	*	65	14	4	9
			(Op: SP9IKN)		
*SP2DNI	7	11,904	159	12	52
*SP3CCT	*	2,214	58	10	31
***SP3PL**	**3.7**	**30,705**	**553**	**11**	**58**
*SP1GZF	*	28,798	436	12	65
*SQ6FHP	*	3,268	180	5	38
*SP4LVK	*	1,440	59	4	26
***SP4ZO**	**1.8**	**25,380**	**478**	**8**	**52**
*SP9RPW	*	24,192	403	8	56
*SP1EK	*	4,995	117	4	41
*SQ3GNA	*	2,698	106	4	34
*SP1EG	*	50	7	4	6
		PORTUGAL			
CT1GPQ	**A**	**2,779,168**	**2692**	**130**	**478**
CT8T	**"**	**1,374,107**	**3399**	**40**	**163**
			(Op: CT1ESV)		
CT1AHU	**28**	**784,355**	**2625**	**29**	**114**
*CT1DZY	A	100	1	1	1
***CT1ESO**	**28**	**470,158**	**1467**	**36**	**133**
*CT1EGF	*	88,638	609	23	79
*CT2FZZ	*	20,355	190	16	43
*CT1ELF	14	10,788	134	10	52
		ROMANIA			
YO8MI	**A**	**87,860**	**254**	**55**	**136**
YO3KPA	**28**	**742,035**	**1886**	**39**	**152**
YO2LHD	*	1,150	30	10	15
YP3A	**7**	**208,896**	**1322**	**27**	**109**
YO2BEH	**1.8**	**10,080**	**234**	**6**	**42**
***YO7LFV**	**A**	**888,888**	**1577**	**87**	**320**
***YO3APJ**	**"**	**267,246**	**511**	**68**	**235**
*YO7ARY	*	189,126	519	65	172
*YO7LBX	*	182,546	532	52	186
*YO3CZW	*	155,268	455	59	169
*YO3FLQ	*	112,385	394	42	127
*YO3NL	*	88,032	402	53	171
*YO9FYP	*	43,329	205	38	105
*YO5BWI	*	28,441	213	29	90
*YO5OSF	*	28,380	235	22	88
*YO7GWA	*	28,296	252	22	86
*YO3III	*	13,300	103	25	75
*YO3CVG	*	9,744	77	29	55
*YO2KQD	*	1,634	47	10	28
*YO4BSM	*	324	12	9	9
***YO3HOT**	**28**	**60,255**	**302**	**26**	**77**
*YO5CRQ	*	50,808	248	24	63
*YO5AJR	*	47,520	249	25	65
*YO6BHN	*	35,840	120	29	83
*YO9CXE	*	24,518	143	23	59
*YO8DHD	*	14,750	143	17	42
*YO5TP	*	3,510	30	17	22
*YO8TRS	*	782	18	8	15
***YO2LLL**	**21**	**192,240**	**887**	**31**	**113**
***YO1M**	**"**	**148,709**	**913**	**28**	**93**
			(Op: YO3JW)		
*YO3AIL	*	39,538	246	26	80
*YO3CDN	*	15,946	191	15	52
*YO4ATW	*	12,920	76	25	51
*YO9HG	7	1,568	53	6	26
*YO8AII	1.8	1,188	41	5	22
		SARDINIA			
IS0KEB	**28**	**570,096**	**1897**	**34**	**114**
***IS0LLJ**	**A**	**133,120**	**428**	**51**	**157**
*IS0VSG	*	90,389	246	59	162
		SCOTLAND			
GM7V	**A**	**5,691,290**	**4149**	**141**	**541**
			(Op: GM4YXI)		
GM0F	**"**	**2,905,606**	**2997**	**121**	**457**
			(Op: GM4AFF)		
GM3POI	*	235,466	703	37	102
MM0LEO	*	102,416	314	42	131
***GM0FET**	**A**	**594,300**	**930**	**69**	**281**
***GM0TGE**	**"**	**526,524**	**818**	**79**	**269**
*GM3BCL	*	117,813	552	56	171

***MM0BERK**	**21**	**34,510**	**355**	**16**	**69**
***MM0BQI**	**3.7**	**6,943**	**105**	**8**	**45**
		SICILY			
IT9VCE	**A**	**552,640**	**1184**	**78**	**274**
***IT9ORA**	**A**	**107,666**	**396**	**50**	**152**
*IT9YAO	*	100,096	449	45	136
***IT9JOF**	**28**	**280,625**	**992**	**31**	**94**
*IT9YSW	*	9,610	69	21	41
*IT9RJE	14	17,052	271	17	67
		SLOVAK REPUBLIC			
OM5M	**A**	**565,440**	**1680**	**36**	**124**
			(Op: OM4DW)		
OM3NA	**21**	**753,233**	**2063**	**35**	**133**
OM4XA	*	101,523	399	29	100
OM0C	**3.7**	**184,140**	**1405**	**22**	**88**
			(Op: OM2TW)		
***OM6RM**	**A**	**602,842**	**1052**	**86**	**297**
***OM4DN**	**"**	**479,526**	**889**	**77**	**272**
*OM7RU	*	260,208	615	71	241
*OM3YK	*	206,048	504	65	209
*OM3PQ	*	160,146	357	60	186
*OM6TX	*	86,668	327	46	142
*OM7AG	*	82,641	301	44	125
*OM1AW	*	61,374	273	36	123
*OM8HG	*	16,284	144	23	69
*OM4TX	*	15,552	129	19	77
***OM2VL**	**21**	**253,640**	**743**	**37**	**133**
*OM7YC	*	61,701	313	31	100
*OM4WW	*	56,525	349	26	93
***OM7AB**	**3.7**	**33,051**	**506**	**9**	**60**
*OM3RRF	*	132	11	4	8
			(Op: OM4AA)		
		SLOVENIA			
S57DX	**A**	**4,959,416**	**3518**	**143**	**536**
S53EO	**"**	**3,274,708**	**3217**	**109**	**373**
S56A	*	1,689,216	1344	136	528
S52A	*	1,183,534	1218	106	400
S58D	**28**	**1,024,200**	**2341**	**38**	**142**
S50K	**"**	**1,018,868**	**2341**	**38**	**141**
S570	**21**	**886,405**	**2379**	**38**	**131**
S51FB	*	667,704	1821	37	135
S50A	**7**	**574,896**	**2302**	**37**	**131**
S54E	**3.7**	**174,570**	**1190**	**23**	**92**
S57M	**1.8**	**77,784**	**886**	**12**	**72**
***S51F**	**A**	**1,573,947**	**1495**	**116**	**421**
***S57CQ**	**"**	**1,387,098**	**1789**	**95**	**363**
*S51DI	*	933,745	876	108	397
*S51NZ	*	546,432	833	83	301
*S52G	*	475,672	847	65	231
*S59TTT	*	447,321	806	85	272
			(Op: S51DU)		
*S58WW	*	441,531	869	68	169
*S58RU	*	340,234	685	71	240
*S57MTA	*	283,335	629	58	137
*S59X	*	242,788	528	57	146
*S57KAA	*	54,912	205	36	96
*S52T	*	34,584	152	40	92
*S51DX	*	12,986	128	20	66
*S57U	*	12,382	60	33	49
***S57J**	**28**	**344,190**	**902**	**37**	**117**
*S54X	*	196,710	495	35	131
*S57MHA	*	76,900	345	28	72
***S51NM**	**3.7**	**20,480**	**298**	**9**	**55**
***S500**	**1.8**	**38,304**	**638**	**10**	**66**
		SPAIN			
EA4KD	**A**	**4,785,046**	**3774**	**138**	**492**
EA3NY	**"**	**4,367,994**	**3625**	**125**	**432**
EA5DFV	**"**	**3,910,340**	**3677**	**111**	**419**
EA1DAX	*	1,368,033	1735	85	308
EA3CCN	*	752,700	1178	89	297
EA5BY	*	448,234	705	72	199
EA1BXK	*	430,869	647	81	258
EA1JO	*	401,050	680	79	246
EA1AKS	*	386,802	1045	53	121
EA2ARW	*	369,628	617	67	240
EA3APS	*	293,001	600	73	230
EA4NP	*	73,872	180	60	156
EA7KN	*	21,504	266	16	16
EA3BJM	*	14,415	111	30	63
EA1DFP	*	1,980	33	17	28
EA3QP	**28**	**1,312,329**	**2812**	**39**	**162**
EA7GSU	*	34,170	264	20	65
EA3DUZ	*	9,780	73	21	39
EA3IN	**21**	**639,282**	**1810**	**39**	**147**
EA3KU	**"**	**582,306**	**1707**	**37**	**146**
EA5HT	*	237,688	1006	32	116
EA3ALV	**3.7**	**24,568**	**278**	**11**	**63**
EA5CGU	**1.8**	**14,784**	**236**	**9**	**57**
EA5GCT	*	5,400	117	7	43
***EA7RM**	**A**	**3,229,525**	**2725**	**110**	**413**
***EA3FCQ**	**"**	**1,381,772**	**1770**	**94**	**333**
***EA5AER**	**"**	**1,358,307**	**1978**	**71**	**262**
***EA7RU**	**"**	**1,215,796**	**1415**	**98**	**348**
*EA3KN	*	926,550	1137	94	332
*EA1WS	*	911,225	1664	65	222
*EA1AJV	*	717,552	1337	68	234
*EA5ASF	*	625,757	1049	81	268
*EA4BFK	*	504,570	990	69	209
*EA3NA	*	485,442	709	87	275
*EA5OL	*	483,585	844	78	231
*EA1CJH	*	369,184	561	80	252
*EA3AKA	*	355,365	848	59	206
*EA2RY	*	346,104	935	57	207
*EA5QB	*	277,088	681	50	174
*EA2AAZ	*	270,240	673	61	179
*EA4DAT	*	262,144	656	62	194
*EA3DUM	*	236,744	678	52	150
*EA3TA	*	203,940	510	53	167
*EA3AGB	*	203,038	477	60	182
*EA3EYD	*	189,024	438	61	203
*E A7EWX	*	166,554	451	51	155
*EA2BNU	*	164,358	431	52	155
*EA3GEO	*	130,816	328	58	166
*EA1RH	*	126,918	503	39	159
*EA2AVM	*	102,044	329	54	140
*EA1SH	*	98,280	355	52	158
*EA4KR	*	89,401	261	46	123
*EA1MK	*	68,325	365	27	48
*EA5DWS	*	49,436	334	20	48
*EA1QR	*	48,735	260	34	101
*EA5DFX	*	44,880	380	15	45
*EA1DBC	*	38,130	145	36	57
*EA1CXH	*	37,878	166	31	87
*EA3GBU	*	37,260	271	25	56
*EA1CYU	*	37,240	128	38	95
*EA7CA	*	37,180	151	38	92
*EA7FIQ	*	36,240	156	39	81

*EA5AFH	*	32,088	133	40	128
*EA4CU	*	24,856	124	28	76
*EA4EIY	*	23,265	155	39	102
*EC2AH	*	23,129	107	31	70
*EA1BZP	*	21,329	218	15	62
*EA3BAK	*	20,904	173	31	73
*EA1GL	*	16,800	72	42	63
*EA1CIS	*	15,510	103	38	72
*EA3NO	*	14,432	66	35	47
*EA3ATD	*	14,098	172	36	97
*EA1AAA	*	13,640	53	38	50
*EC4AKC	*	13,590	148	28	62
*EC7DHJ	*	13,182	115	23	55
*EA2CHL	*	10,611	145	15	66
*EA7BVA	*	10,251	84	24	43
*EA3ARN	*	9,512	110	16	66
*EA4WD	*	9,125	84	23	50
*EA1BID	*	7,590	72	18	37
*EC3AIV	*	7,590	68	21	34
*EA2BIB	*	7,268	73	22	57
*EA4EMC	*	7,021	52	24	35
*EA7CWV	*	5,695	67	25	42
*EA2AZ	*	4,300	34	20	30
*EC1DLG	*	962	23	9	17
*EC3ACF	*	208	9	7	6
***EA7FTR**	**28**	**528,984**	**1718**	**32**	**126**
***EA5BTL**	**"**	**376,216**	**1163**	**35**	**113**
***EA5KV**	**"**	**344,190**	**1228**	**33**	**121**
*EA5ON	*	248,724	917	35	112
*EA7IA	*	231,397	834	32	117
*EA5AAJ	*	203,116	755	28	88
*EA7GDP	*	200,056	989	31	105
*EA5FST	*	147,312	662	25	99
*EA1KX	*	146,328	506	29	105
*EA5WX	*	123,654	553	29	82
*EA5AJX	*	106,887	412	30	93
*EA5DIT	*	45,248	246	27	74
*EA4AES	*	44,462	237	22	72
*EA5TN	*	15,504	103	19	49
*EA3GCJ	*	14,256	96	22	50
*EA1BAF	*	14,042	138	16	43
*EA7BBB	*	12,870	135	18	48
*EA4GW	*	12,636	167	16	38
*EA1LZ	*	10,080	104	14	22
*EA3ACA	*	4,860	72	14	31
*EA5AOM	*	4,264	37	24	28
***EA7HBP**	**21**	**352,728**	**1469**	**28**	**110**
*EA1YB	*	147,447	825	28	99
*EA2BLK	*	139,345	550	31	114
*EA1BIM	*	108,978	550	26	97
*EA7ANM	*	71,910	599	20	70
*EA7KJ	*	69,368	438	20	84
*EC3CJN	*	61,946	566	21	73
*EC1DMQ	*	44,226	427	20	71
*EA2RU	*	22,120	178	17	62
*EA3CJZ	*	209	9	5	6
***EA3GHZ**	**14**	**293,058**	**1204**	**36**	**126**
*EA4EJP	*	102,265	649	26	87
*EA1AAW	*	86,853	442	27	104
*EA5EOR	*	75,369	483	23	88
*EA7FRX	*	48,682	288	22	79
*EA4CT	*	42,513	240	27	84
*EA3FHP	*	1,260	40	6	22
***EA3FF**	**7**	**19,789**	**183**	**14**	**63**
*EA3KT	*	3,835	124	10	49
*EA7HE	3.7	544	68	5	29
		SVALBARD			
JW5E	**A**	**1,192,604**	**1346**	**109**	**273**
			(Op: JW5NM)		
		SWEDEN			
7S2E	**A**	**2,204,200**	**2340**	**129**	**386**
			(Op: SM2DMU)		
SM5CEU	**"**	**1,119,230**	**1338**	**117**	**425**
SM5AOE	*	865,697	1137	97	340
SM7CQY	*	776,136	1006	96	347
SM6WQB	*	342,160	706	70	259
SM3BIZ	*	265,893	507	82	255
7S2A	*	179,095	341	72	229
			(Op: SM2LWU)		
SM7EHU	*	151,060	268	84	176
SM6IOD	*	85,249	271	44	119
8S4Z	*	54,912	233	49	94
			(Op: SM4SET)		
SM3X	*	7,912	60	34	52
			(Op: SM3CVM)		
SK7IJ	**28**	**146,160**	**608**	**29**	**116**
SM0KV	21	9,120	71	19	57
SL3A	**14**	**851,228**	**2543**	**38**	**134**
			(Op: SM3JLA)		
7S5C	*	39,900	301	22	73
			(Op: SM5CBM)		
SM6FUD	**7**	**42,168**	**397**	**19**	**65**
SM4F	**1.8**	**24,360**	**428**	**7**	**53**
			(Op: SM4DHF)		
***SM6D**	**A**	**563,040**	**996**	**75**	**265**
			(Op: SM6DER)		
***SM4AIO**	**"**	**307,740**	**695**	**59**	**217**
*7S6J	*	193,494	499	50	188
			(Op: SM0JSM)		
*SM7GXR	*	189,816	462	64	200
*SM6XKB	*	135,807	431	53	170
*SM0BDS	*	114,678	330	57	150
*SM6NET	*	85,504	295	50	117
*SM0FM	*	82,344	220	53	135
*SM6MVL	*	72,182	233	46	147
*SM7BJW	*	35,910	130	45	88
*SM7CWI	*	34,036	152	42	85
*8S0W	*	26,125	86	45	80
			(Op: SM0NJO)		
*SM7BQX	*	21,216	153	29	75
*SM4XIH	*	18,810	96	35	75
*SM3T	*	12,320	110	20	57
			(Op: SM3RUJ)		
***SM5D**	**28**	**167,006**	**502**	**30**	**121**
			(Op: SM5DJZ)		
*SK4UW	*	36,890	252	22	63
			(Op: SM4JHK)		
*SM7VHS	*	9,741	96	16	35
*7S7B	*	1,540	27	10	10
			(Op: SM7OHB)		
***8S7A**	**21**	**291,146**	**1078**	**35**	**114**
			(Op: SM7CRW)		
*7S7V	*	56,511	263	28	89
			(Op: SM7VZX)		
*SM6AHU	14	4,230	94	10	35
***SM6DOI**	**7**	**40,020**	**356**	**17**	**70**
*SM4HEJ	*	575	26	4	21
		SWITZERLAND			
HB9ACA	**28**	**234,324**	**641**	**33**	**105**

HB9BTI	**"**	**213,500**	**774**	**32**	**93**
***HB9AAP**	**A**	**282,492**	**503**	**65**	**201**
***HB9AWS**	**"**	**253,814**	**587**	**57**	**221**
*HB9HQX	*	4,331	71	17	44
***HB9AA**	**28**	**142,375**	**461**	**32**	**93**
			(Op: HB9ARF)		
*HB9DCM	*	113,916	352	29	103
		UKRAINE			
UV7D	**A**	**3,081,330**	**2928**	**131**	**472**
			(Op: UT7DX)		
UY5ZZ	**"**	**1,303,974**	**1400**	**123**	**430**
UV5U	**"**	**1,017,450**	**1361**	**102**	**373**
			(Op: UX1UA)		
EM6M	*	575,280	1568	98	325
			(Op: UT5MB)		
UW7M	*	510,384	1025	84	308
			(Op: UR3MP)		
UR5ZMK	*	458,657	789	77	260
UX5UO	*	218,434	361	88	210
UT2UB	*	150,800	422	71	189
US1MM	*	102,147	301	62	175
UT4MW	*	72,092	310	35	99
UT7MD	*	52,974	168	45	117
US0LW	*	33,075	113	55	80
UT7QL	**28**	**108,256**	**412**	**32**	**104**
UT5IZ	*	94,304	674	28	84
UX0FF	**21**	**962,298**	**2656**	**40**	**153**
UT2IY	*	397,212	1527	36	122
UR0FO	*	336,800	1160	36	124
			(Op: UT9FJ)		
UT0H	*	243,840	1081	35	125
			(Op: UT1HT)		
UR6MX	*	169,195	731	33	104
US0HZ	*	99,660	469	29	103
UY0ZG	*	80,376	327	31	105
UZ4E	**14**	**282,975**	**1154**	**36**	**139**
			(Op: UR7EU)		
UT4EK	*	54,500	444	20	80
UX2MF	**3.7**	**48,843**	**549**	**12**	**69**
UU4JKY	*	100	339	9	53
UT5CB	**1.8**	**4,005**	**107**	**8**	**37**
***UW5U**	**A**	**788,558**	**1334**	**90**	**329**
			(Op: UY2UA)		
***UR5IFB**	**"**	**615,368**	**899**	**91**	**297**
*UT8IT	*	313,939	725	67	246
			(Op: YT8IT)		
*UY7C	*	260,590	735	50	203
			(Op: UR3CMA)		
*UT2UZ	*	256,576	408	74	230
*US5II	*	246,732	427	95	253
*UR6QS	*	179,547	504	62	229
*UR7IKV	*	156,861	565	63	198
*UR6IRA	*	147,476	541	49	180
*UY5TE	*	147,407	507	42	179
*UX5EF	*	129,564	390	52	192
*UT5UML	*	117,359	318	63	164
*UT5UKY	*	102,578	337	60	178
*UY0MF	*	92,250	308	54	171
*UR5WIF	*	91,469	302	43	136
*UU9CW	*	74,375	163	58	117
*UR5GFO	*	57,300	318	38	112
*UR5HAC	*	54,549	147	58	113
*UT5JAP	*	32,718	91	50	83
*UR3HC	*	23,424	105	46	76
*UT5AY	*	9,401	83	24	55
***UR3QFB**	**28**	**140,256**	**526**	**31**	**113**
*UX7DX	*	120,632	354	33	103
*US6IMA	*	87,055	514	26	89
*UT7NW	*	65,665	243	30	85
*UX7UN	*	62,622	302	29	97
*UR5MIW	*	26,244	173	23	58
*US5WMS	*	25,915	147	22	51
*UT1EJ	*	828	22	6	17
***US7IGF**	**21**	**278,025**	**974**	**35**	**130**
***UW8M**	**"**	**238,836**	**998**	**35**	**121**
			(Op: UR5MID)		
*UR6IJ	*	198,594	801	33	120
*UR5VZ	*	75,692	298	30	97
***UX3MR**	**14**	**132,464**	**648**	**30**	**106**
*UT4MF	*	44,460	240	27	90
*US1PM	*	22,854	210	19	59
*UR8QY	*	9,856	128	14	50
***UZ5U**	**7**	**49,868**	**424**	**17**	**74**
			(Op: UT4UO)		
*UT4PZ	*	744	27	5	19
***US2WU**	**3.7**	**29,640**	**343**	**19**	**76**
*UY2RO	*	9,900	195	7	48
***UX5NO**	**1.8**	**21,318**	**472**	**10**	**56**
*UR5IDP	*	8,215	157	8	45
*US0QG	*	315	18	3	12
		WALES			
GW4BLE	**A**	**5,251,157**	**3834**	**130**	**477**
GW7X	*	261,360	687	62	208
			(Op: MW5EPA)		
***GW3NJW**	**A**	**50,042**	**185**	**36**	**95**
***MW0CRI**	**21**	**60,112**	**391**	**25**	**79**
***MW5HOC**	**7**	**9,185**	**133**	**11**	**44**
		YUGOSLAVIA			
YU1ZZ	**28**	**833,924**	**2057**	**38**	**144**
YZ1U	**"**	**582,099**	**1647**	**37**	**122**
			(Op: YU1WS)		
YZ1ZA	*	469,896	1289	35	133
YU1KX	*	342,963	1167	37	122
YT6A	**21**	**1,027,140**	**2550**	**38**	**152**
YT1RA	*	457,444	1783	31	106
YZ9A	**14**	**635,719**	**1912**	**39**	**158**
			(Op: YU1EA)		
YT1BB	*	245,718	1384	32	114
YT7A	**7**	**418,264**	**1770**	**32**	**122**
			(Op: 4N7DW)		
YTBA	**3.7**	**189,244**	**1201**	**24**	**97**
			(Op: YU1AO)		
YU7JX	**"**	**120,186**	**1150**	**19**	**80**
YU1JW	*	102,720	883	17	79
YU1CC	*	25,986	339	9	62
4O6A	**1.8**	**49,476**	**564**	**11**	**65**
			(Op: T95A)		
***YT1LT**	**A**	**383,098**	**768**	**78**	**256**
*YU1PJ	*	41,942	200	33	101
***YT1LD**	**28**	**724,005**	**1810**	**37**	**136**
*YU7WW	*	361,872	930	37	131
*YU7YZ	*	135,708	429	29	100
*YZ1V	*	93,849	411	25	84
			(Op: YU1WS)		
*YU7KM	*	42,097	220	24	65
***YU7KWX**	**21**	**265,512**	**884**	**34**	**122**
***YU7ZZ**	**14**	**388,512**	**1645**	**37**	**134**
*YU1AFR	*	36,642	323	18	75
			(Op: YT1KMK)		

***4N0B**	**3.7**	**41,144**	**579**	**9**	**65**
			(Op: 4N1KW)		
***4N7ZZ**	**1.8**	**18,304**	**271**	**10**	**54**

OCEANIA

		AUSTRALIA			
VK5GN	**A**	**3,612,654**	**2876**	**118**	**331**
VK8AA	**"**	**2,447,474**	**2406**	**112**	**270**
VK2FHN	*	542,015	923	77	138
VK2APG	*	485,886	739	96	186
VK6KKD	*	295,472	512	70	166
VK2BCQ	*	106,582	275	63	98
VK4TI	*	42,625	145	46	79
VK4WPX	*	10,332	60	38	44
VK1MJ	7	4,950	39	18	32
***VK3TZ**	**A**	**1,189,440**	**1252**	**113**	**241**
*VK4DX	*	524,552	800	78	160
*VK8AV	*	98,050	198	58	127
*VK4FJ	*	73,170	210	54	81
*VK4BJD	*	51,520	147	44	96
*VK5EMI	*	6,936	52	18	33
***VK4EJ**	**28**	**368,534**	**1293**	**27**	**76**
*VK5LA	21	9,802	71	19	39
*VK2AAC	14	4,042	36	18	25
***VK4UC**	**7**	**38,934**	**224**	**24**	**39**
		BELAU			
T88EA	**A**	**2,842,441**	**2999**	**110**	**233**
			(Op: JH1EAQ)		
		EAST MALAYSIA			
9M6A	**14**	**630,154**	**1491**	**36**	**125

*LU9GDN	*	198,816	817	28	86	
*LU7YW	*	178,299	747	22	77	
*LU2FDN	*	137,772	667	28	58	
*LW7EGO	*	105,830	444	24	71	
*LW3ETE	*	94,088	605	21	55	
*LU8DY	*	49,280	338	18	38	
*LU9DX	*	8,378	109	16	43	
***L44DX**	**21**	**409,386**	**1174**	**32**	**110**	
			(Op: LW1DTZ)			
*LU7JA	*	95,590	507	19	60	
*LU4HKL	*	10,166	102	19	27	
***LU1MA**	**7**	**10,790**	**89**	**20**	**45**	
***LU8EEM**	**3.7**	**1,598**	**31**	**14**	**20**	
		ARUBA				
P40B	**A**	**9,630,495**	**6470**	**134**	**419**	
			(Op: P43P)			
P43E	**28**	**1,169,193**	**2776**	**30**	**121**	
P40A	**14**	**2,129,650**	**4185**	**38**	**153**	
			(Op: KK9A)			
***P40W**	**A**	**6,670,839**	**4336**	**124**	**429**	
			(Op: W2GD)			
		BOLIVIA				
CP6UA	**A**	**1,611,764**	**2319**	**84**	**224**	
		BRAZIL				
PY7ZY	**A**	**2,375,944**	**2408**	**87**	**269**	
PY5KD	**"**	**1,172,699**	**1428**	**87**	**254**	
PV2M	*	348,768	832	54	114	
			(Op: PT2ADM)			
PY3PA	*	287,804	573	63	148	
PY3MT	*	5,022	34	28	34	
ZY5G	**28**	**1,508,940**	**3420**	**35**	**145**	
			(Op: PP5WG)			
PP5KE	*	713,988	1957	31	101	
PY2BT	*	360,149	1067	32	107	
PY1ZV	*	167,840	868	23	57	
PY3MSS	*	3,698	50	17	26	
ZX5J	**21**	**2,236,500**	**3949**	**40**	**170**	
			(Op: PP5JR)			
PY2OZF	*	21,484	227	15	26	
PY3MM	**14**	**972,441**	**2179**	**38**	**129**	
PY2NY	**"**	**963,796**	**2039**	**37**	**129**	
PY5HSD	*	368,650	1037	36	110	
PX5A	**7**	**30,195**	**267**	**19**	**36**	
			(Op: PY3DX)			
PY6KY	*	1,584	36	12	21	
PU3A	**3.7**	**25,360**	**214**	**22**	**58**	
			(Op: PY3DX)			
PV8DX	**1.8**	**882**	**27**	**5**	**13**	
PP5VB	*	288	11	7	9	
PY3CEJ	*	100	22	9	11	
***ZX2B**	**A**	**3,391,158**	**2626**	**103**	**350**	
			(Op: PY2MNL)			
***PY2NA**	**"**	**1,403,314**	**1856**	**78**	**203**	
*PY3FOX	*	975,860	1277	81	214	
*PR7FN	*	355,290	771	53	142	
*PP2RON	*	246,372	465	57	139	
*PY2EMC	*	207,385	306	85	210	
*PY7EG	*	200,688	460	58	164	
*PY3OL	*	185,525	375	64	141	
*PT2GE	*	164,160	383	49	143	
*PY2DJ	*	163,674	422	55	134	
*PS8HF	*	160,080	778	26	89	
*PP5ZP	*	144,300	386	53	132	
*PY3MFC	*	66,417	415	51	80	
*PS8NF	*	60,903	363	26	75	
*PP7ZZ	*	44,144	148	37	87	
*PY7IQ	*	27,265	129	36	59	
*PY3ASM	*	26,676	173	40	68	
*PY5DZ	*	21,280	143	37	58	
*PY3NH	*	5,390	72	25	24	
*PY2NDX	*	5,292	34	31	32	
*PY1WAG	*	4,816	33	27	29	
*PY1AFS	*	1,755	24	17	22	
*PY3TIO	*	1,600	30	15	17	
***PY2SBY**	**28**	**648,600**	**1742**	**32**	**118**	
***ZY3C**	**"**	**602,648**	**1750**	**33**	**109**	
			(Op: PY3OC)			
*PY4DBU	*	425,180	1090	31	109	
*PP5MQ	*	316,720	1080	26	81	
*PY2TST	*	217,564	778	27	82	
*PY2KPY	*	145,970	589	26	84	
*PY2OF	*	63,916	402	19	39	
*PR7AB	*	63,726	369	20	66	
*PY4ZN	*	42,880	322	21	59	
*PU2TES	*	42,330	245	25	58	
*PY3CGP	*	23,598	149	22	47	
*PY5DC	*	17,408	116	18	50	
*PU3GTF	*	15,876	130	20	34	
*PU2PTO	*	10,773	186	16	41	
*PY3ASU	*	8,100	105	20	40	
*PU5RAS	*	7,992	79	21	33	
*PY4PW	*	6,300	64	16	29	
*PY3OS	*	5,000	71	18	32	
*PY3SB	*	4,698	39	18	36	
*PY2SAA	*	4,089	40	15	32	
*PS8ET	*	930	18	13	18	
*PY3CAL	*	528	36	12	12	
*PY1JRS	*	378	11	10	11	
*ZV2V	*	340	38	7	10	
			(Op: PY2LED)			
***PY3FBI**	**21**	**93,575**	**382**	**26**	**69**	
*PY2DA	*	86,856	402	28	60	
*PT2ND	*	32,973	158	24	63	
*PY2APQ	*	24,272	148	23	59	
*PY7BEL	*	10,974	83	15	44	
*PY3AJB	*	6,825	65	14	25	
***PY1NX**	**14**	**106,821**	**478**	**25**	**58**	
*PR7QI	*	23,895	160	16	43	
*PY1KX	7	903	18	7	14	
		CHILE				
CE8EIO	**A**	**257,250**	**664**	**56**	**94**	
CE3PG	*	163,875	512	47	78	
CE4Y	**28**	**862,650**	**2265**	**32**	**110**	
			(Op: CE4FXY)			
CE6BDN	*	31,577	221	22	69	
CE6ABC	**21**	**161,200**	**740**	**28**	**96**	
CE3PA	**14**	**172,026**	**911**	**30**	**84**	
***3G5A**	**A**	**1,170,906**	**1888**	**74**	**152**	
			(Op: XQ5SM)			
*XQ1ZW	*	482,406	876	78	144	
*CE1VXB	*	105,183	371	46	71	
*CE4MLN	*	1,044	19	13	16	
***CE4EM**	**28**	**100,594**	**397**	**23**	**83**	
*CA2WUI	*	32,782	200	18	56	
*CA6VMR	*	10,944	141	18	39	
*CE6VMO	*	100	113	16	31	
***CE4U**	**21**	**72,865**	**320**	**24**	**71**	
			(Op: CE4USW)			
*XQ2PPA	*	2,781	49	12	15	
		COLOMBIA				
HK3SVP	**A**	**37,260**	**178**	**45**	**90**	
***HK3AXY**	**A**	**212,823**	**522**	**48**	**105**	
*HK6PSG	*	10,880	99	17	23	
		EASTER ISLAND				
***CA0YAM**	**28**	**266,730**	**1007**	**26**	**76**	
		ECUADOR				
HC2GT	**A**	**1,235,842**	**2382**	**65**	**153**	
HC0E	*	9,261	80	22	41	
***HC1JQ**	**28**	**1,187,460**	**2296**	**34**	**145**	
		FERNANDO DE NORONHA				
PT0F	**A**	**12,796,580**	**7510**	**138**	**472**	
			(Op: CT1BOH)			
		FRENCH GUIANA				
***FY5FY**	**A**	**8,508,468**	**5502**	**126**	**430**	
		JUAN FERNANDEZ ISLANDS				
***CE0Z**	**A**	**307,780**	**630**	**60**	**160**	
			(Op: CE6TBN)			
		NETHERLANDS ANTILLES				
***PJ4/OH1VR**	**28**	**1,248,528**	**2972**	**32**	**116**	
		PARAGUAY				
ZP6T	**21**	**786,084**	**2087**	**36**	**120**	
***ZP9ZPA**	**28**	**55,776**	**280**	**27**	**56**	
		SOUTH SHETLAND ISLANDS				
R1ANF	**A**	**902,094**	**1510**	**74**	**177**	
			(Op: UA1PAW)			
		SURINAME				
PZ5RA	**A**	**1,451,800**	**1568**	**98**	**242**	
		TRINIDAD & TOBAGO				
9Y4NZ	**14**	**1,568,583**	**3325**	**37**	**134**	
9Y4TBG	**7**	**912,950**	**2058**	**34**	**121**	
			(Op: DL4MEH)			
***9Y4/NG5E**	**A**	**197,152**	**748**	**38**	**63**	
***9Z4DZ**	**21**	**97,416**	**402**	**21**	**67**	
		URUGUAY				
CX5BW	**28**	**1,687,442**	**3960**	**35**	**138**	
CX7ACH	*	692,646	1976	31	103	
***CX9AU**	**A**	**1,234,800**	**1448**	**91**	**224**	
***CX2TG**	**28**	**585,035**	**1722**	**28**	**93**	
*CX4DX	*	160,269	515	30	93	
*CX3TQ	*	114,786	787	20	43	
***CX7BY**	**21**	**411,680**	**934**	**33**	**122**	
		VENEZUELA				
YV5MBX	**3.7**	**53,295**	**377**	**17**	**38**	
YV1CR	*	16,280	259	12	28	
***YY5JMM**	**28**	**512,637**	**1769**	**27**	**80**	
*YV7QP	*	68,641	362	22	61	
*YY5JRU	*	4,998	60	12	37	
		QRP				
F5BEG	**A**	**1,158,573**	**1197**	**100**	**387**	
SP3KEY	**"**	**963,795**	**1128**	**103**	**366**	
			(Op: SP3DWQ)			
YT7TY	**"**	**925,010**	**1340**	**99**	**367**	
N4KG	**"**	**625,488**	**740**	**89**	**225**	
JR4DAH	**"**	**567,948**	**764**	**85**	**197**	
JA1YNE	**"**	**437,570**	**650**	**81**	**185**	
N0KE	**"**	**427,305**	**554**	**91**	**214**	
IK5RUN	**"**	**360,914**	**452**	**97**	**265**	
DF1DX	**"**	**304,720**	**530**	**60**	**200**	
UA9AMF	**"**	**295,380**	**485**	**69**	**201**	
JI2KVW	**"**	**259,875**	**489**	**74**	**151**	
YU1LM	**"**	**255,636**	**652**	**55**	**188**	
SP3BLT	**"**	**227,304**	**592**	**62**	**202**	
N5FPW/4	**"**	**210,330**	**337**	**71**	**175**	
K8ZT	**"**	**205,680**	**356**	**70**	**170**	
OK2KFK	**"**	**205,088**	**604**	**54**	**178**	
			(Op: OK2ZAW)			
RX3RC	**"**	**203,008**	**498**	**65**	**191**	
N8IE	**"**	**197,883**	**403**	**53**	**136**	
GW3JXN	**"**	**186,624**	**406**	**61**	**182**	
KI0OV	**"**	**150,084**	**318**	**67**	**131**	
KR1ST/4	**"**	**141,300**	**315**	**45**	**135**	
W6YJ	**"**	**137,940**	**277**	**77**	**132**	
RZ9IB	**"**	**130,539**	**336**	**43**	**116**	
W6RCL	**"**	**109,716**	**264**	**61**	**103**	
YO8WW	**"**	**108,808**	**323**	**72**	**160**	
W7/KH7YD	**"**	**90,117**	**246**	**55**	**98**	
N2UM/4	*	81,360	189	53	127	
G3FNM	**"**	**80,320**	**339**	**35**	**125**	
W9RPM	**"**	**74,028**	**189**	**66**	**120**	
GM4HQF	**"**	**73,914**	**301**	**30**	**97**	
N8XA	*	70,771	179	62	119	
KQ4YY	*	67,848	217	35	97	
G4DDX	*	67,353	304	37	120	
EA1BP	**"**	**62,384**	**255**	**34**	**78**	
EA1GT	*	60,775	269	37	106	
JI1AQY	*	60,762	213	45	78	
NJ2F/4	*	58,050	166	40	95	
K4LQ	*	56,151	131	40	113	
LY3BY	**"**	**53,428**	**305**	**30**	**118**	
ES8SW	**"**	**47,583**	**267**	**32**	**121**	
AY5FZ	**"**	**43,575**	**192**	**32**	**51**	
			(Op: LU5FZ)			
YO4AAC	*	43,492	258	32	99	
HA5IW	*	41,038	456	76	213	
US0YA	**"**	**38,080**	**127**	**41**	**95**	
C6A/VA3SWG	**"**	**37,275**	**247**	**28**	**77**	
US5IND	*	35,697	243	39	124	
WB6BWZ/4	*	34,200	177	39	75	
JL7XBN	**"**	**25,298**	**116**	**35**	**56**	
K5DKH	*	23,226	119	37	61	
GM4ELV	*	21,012	192	23	79	
UA3SGA	*	19,190	115	34	67	
SQ9FCH	*	18,564	168	22	80	
LX1NO	**"**	**17,520**	**109**	**24**	**56**	
VE3WZ	*	16,863	95	20	57	
NQ7X	*	13,855	83	37	48	
OE1AZU	**"**	**12,882**	**132**	**25**	**49**	
JH1RMH	*	12,180	90	24	34	
ON7CC	*	11,938	116	25	69	
AI2P/3	*	11,455	78	31	48	
AA2VK	*	9,261	60	23	40	
W2JEK	*	8,296	58	23	38	
VK3VP	**"**	**5,625**	**61**	**38**	**37**	
EY8BA	**"**	**5,538**	**121**	**17**	**54**	
ZV8I	*	5,329	77	29	44	
			(Op: PV8IG)			
UZ5UA	*	4,891	57	24	43	
9V1XE	**"**	**4,644**	**45**	**24**	**30**	
K8SAR	*	2,730	33	20	22	
W4DEC	*	2,496	29	19	20	
K6MI	*	1,599	24	19	20	
VE3IGJ	*	920	29	10	13	
UR5MFR	*	624	131	25	79	
RA3XEV	*	608	19	5	11	
N0HRL	*	450	16	10	8	
UA3QIX	*	330	14	8	14	
TT8ZZ	**28**	**558,000**	**1613**	**28**	**96**	
			(Op: F5PTM)			
EA2CAR	**"**	**319,599**	**854**	**34**	**137**	
UN4L	**"**	**258,720**	**721**	**30**	**110**	
			(Op: RN9AO)			
LR7E	**"**	**242,962**	**880**	**28**	**90**	
			(Op: LW3DX)			
SP4GFG	**"**	**197,706**	**577**	**36**	**130**	
JR3RWB	**"**	**192,465**	**510**	**33**	**108**	
LW7DQW	**"**	**149,058**	**614**	**23**	**75**	
J79UF	**"**	**143,864**	**660**	**21**	**77**	
			(Op: VE5UF)			
DH8BQA	**"**	**81,640**	**330**	**24**	**80**	
SP5XMU	**"**	**60,424**	**261**	**30**	**74**	
WB0IWG/3	**"**	**55,488**	**218**	**22**	**74**	
WH6O	**"**	**46,547**	**191**	**30**	**59**	
LU7WW	*	40,756	249	22	70	
G0KDS	**"**	**29,705**	**199**	**17**	**48**	
YO8COM	**"**	**28,056**	**167**	**24**	**60**	
DL6MHW	**"**	**21,294**	**142**	**19**	**44**	
CE3DNP	**"**	**13,542**	**120**	**18**	**43**	
RK6AQV	**"**	**11,022**	**96**	**19**	**47**	
UR5FCM	**"**	**10,506**	**158**	**12**	**39**	
OH5NHI	**"**	**7,752**	**101**	**13**	**44**	
N7IR	**"**	**6,670**	**45**	**25**	**33**	
PY2EYF	**"**	**6,080**	**95**	**14**	**18**	
US9QA	*	5,500	90	17	36	
DL6UAM	*	4,264	69	12	22	
OK1KZE	**"**	**3,538**	**73**	**13**	**16**	
			(Op: OK1XYZ)			
OK1AIJ	*	3,432	62	9	13	
VE6GK	**"**	**1,863**	**59**	**11**	**16**	
JQ1AWC	*	405	13	5	10	
EA6EA	*	315	20	8	13	
OK2ACM	*	100	12	6	9	
KP4KE	**21**	**466,872**	**1528**	**30**	**117**	
KR2Q	**"**	**219,150**	**517**	**30**	**120**	
6D2X	**"**	**184,460**	**1321**	**29**	**63**	
			(Op: XE2Z)			
K9RO	**"**	**182,088**	**428**	**32**	**130**	
LU3DR	**"**	**164,537**	**480**	**32**	**105**	
DL1LH	**"**	**140,600**	**477**	**33**	**119**	
T94OM	**"**	**123,732**	**655**	**29**	**97**	
S57MSU	**"**	**112,190**	**465**	**31**	**99**	
JQ1NGT	**"**	**98,805**	**413**	**25**	**80**	
PA3ELD	**"**	**77,436**	**377**	**25**	**83**	
JR9NVB	**"**	**72,423**	**227**	**33**	**84**	
SP2UKT	**"**	**66,759**	**340**	**25**	**94**	
ES1CW	**"**	**48,875**	**300**	**28**	**87**	
G0DCK	**"**	**38,429**	**316**	**19**	**64**	
N4IJ	**"**	**26,980**	**150**	**19**	**57**	
DL3ABL	*	25,584	159	23	55	
JH2AQI	**"**	**21,868**	**123**	**22**	**49**	
LU2HNP	*	13,804	136	23	45	
JA2LRD	*	8,378	87	20	39	
JR1NKN	*	6,424	69	15	29	
WA6FGV	**"**	**3,751**	**59**	**13**	**18**	
WB7OCV/2	*	3,002	36	11	27	
YC3MM	**"**	**2,695**	**40**	**14**	**21**	
JI8GZS	**"**	**2,108**	**35**	**12**	**19**	
N8VGY	*	64	11	7	9	
EA4DQD	**14**	**53,856**	**370**	**18**	**78**	
W3SE/6	**"**	**35,343**	**147**	**30**	**69**	
N7MB	**"**	**28,600**	**144**	**27**	**61**	
GM0IIO	**"**	**17,088**	**227**	**13**	**51**	
NH2PW	**"**	**15,732**	**93**	**24**	**45**	
OZ6XR	**"**	**13,734**	**215**	**11**	**52**	
LA8WG	**"**	**10,120**	**163**	**9**	**46**	
LU4HMF	**"**	**9,700**	**86**	**17**	**33**	
UY1M	**"**	**8,964**	**108**	**11**	**43**	
			(Op: UR9MM)			
IK0OTJ	*	2,520	62	7	29	
JA3AYX	*	2,035	21	16	21	
JL7BRH	**7**	**7,992**	**74**	**23**	**31**	
OH7FF	**"**	**6,812**	**105**	**9**	**43**	
K3TW	**"**	**4,606**	**44**	**16**	**31**	
W6QU	**"**	**1,972**	**38**	**11**	**18**	
			(Op: W8QZA)			
RX6LDK	*	1,392	40	8	21	
RW3VZ	**3.7**	**54,168**	**263**	**40**	**108**	
IK5WGK	**"**	**39,878**	**145**	**45**	**82**	
S54AA	**"**	**36,640**	**400**	**13**	**67**	
S57NRO	**"**	**15,311**	**259**	**9**	**52**	
OK1IF	**"**	**11,520**	**243**	**6**	**42**	
SP3J	**"**	**5,754**	**144**	**4**	**38**	
			(Op: SP3NGB)			
SQ9ITP	*	100	26	5	16	
4Z5LO	*	12	2	2	2	
YU1RA	**1.8**	**5,265**	**115**	**5**	**40**	
SM0/G4VGO	**"**	**3,360**	**97**	**5**	**35**	
UT2UY	**"**	**945**	**41**	**7**	**14**	
		ASSISTED				
		NORTH AMERICA				
		UNITED STATES				
W1US	**A**	**4,384,860**	**2645**	**144**	**539**	
			(Op: K1LZ)			
W1CU	**"**	**3,263,650**	**1821**	**134**	**516**	
N1DG	**"**	**2,842,750**	**1531**	**141**	**544**	
K1AM	*	2,746,170	1645	133	497	
N1RY	*	1,816,076	1198	121	457	
KK1DX	*	1,506,960	999	125	427	
K2TE/1	*	1,410,765	958	126	451	
K1KD	*	1,344,690	1223	94	308	
W1ZT	*	1,307,994	893	117	437	
K1RV	*	1,228,452	905	111	390	
K1HI	*	1,103,368	960	107	369	
N1API	*	1,081,128	974	88	333	
K1LD	*	1,066,716	889	103	356	
K1JE	*	922,350	811	93	337	
WV1M	*	888,100	790	103	325	
K1VV	*	742,574	693	95	311	
KK1H	*	691,896	706	96	285	
W1LLU	*	623,787	724	76	261	
KW1DX	*	580,544	568	89	297	
K1ST	*	571,912	545	83	305	
W1NG	*	545,664	549	101	283	
W1FY	*	470,394	596	58	223	
			(Op: NC1N)			
N1MD	*	452,928	499	74	262	
K1TH	*	385,237	521	72	217	
W1HR	*	372,283	384	82	277	
W0BR/1	*	342,790	445	78	217	
W1EBI	*	313,540	469	58	199	
N1AU	*	306,940	378	78	220	
AA1QD	*	291,611	331	71	260	
N1NQD	*	289,542	353	88	233	
KD1EA	*	155,874	255	73	176	
K1VR	*	154,770	301	65	145	
K1OZ	*	117,286	257	43	126	
K1SM	*	110,443	227	49	130	
W1AN	*	69,750	205	48	102	
W1RY	*	57,096	134	59	124	
K1AE	*	22,032	78	32	76	
WR1X	*	252	14	9	12	
K8ISO	**14**	**350,244**	**1009**	**36**	**126**	
W2RE	**A**	**5,921,160**	**2955**	**148**	**594**	
K2NG	**"**	**4,732,595**	**2199**	**166**	**639**	
N2MM	**"**	**4,416,000**	**2467**	**147**	**543**	
			(Op: N3MM)			
W2WB	**"**	**4,170,965**	**2449**	**142**	**543**	
W1GD/2	**"**	**3,811,293**	**2030**	**142**	**527**	
NO2R	*	3,618,300	1876	140	560	
WE2F	*	2,905,475	1857	124	451	
W2GDJ	*	2,506,200	1585	135	465	
N1EU/2	*	2,454,518	1380	138	511	
N1RK/2	*	2,176,776	1360	125	463	
N2SS	*	2,035,500	1276	130	460	
W2YC	*	1,992,620	1313	128	474	
W2EN	*	1,954,716	1305	121	427	
NA2U	*	1,939,280	1280	118	442	
NY6DX/2	*	1,860,220	1308	123	439	
K2ONP	*	1,610,715	1220	111	390	
AA2MF	*	1,544,179	1202	112	385	
W2TV	*	1,536,990	1048	120	426	
N1JP/2	*	1,526,452	1117	114	412	
WB3FSR/2	*	1,323,472	1184	99	358	
K2UT	*	1,169,532	913	106	370	
W2RD	*	1,070,496	799	122	382	
K2NJ	*	1,052,572	1002	82	309	
K2XF	*	1,008,672	840	104	352	
K2BX	*	841,722	744	90	319	
K2EP	*	792,429	719	93	314	
KA2D	*	758,540	733	80	311	
NA2NA	*	540,192	617	77	254	
K2PS	*	440,414	488	75	263	
N2WK	*	409,464	438	93	270	
KF2O	*	386,808	353	106	320	
N2CQ	*	263,925	377	57	198	
WA2RF	*	225,680	365	77	171	
W2KA	*	215,380	337	70	172	
WF2B	*	203,196	354	64	172	
K2DBK	*	200,030	315	64	177	
AB2DE	*	151,250	253	73	202	
KE2SD	*	129,685	318	47	138	
K2LCA	*	119,192	296	47	141	
KD2P	*	107,484	199	60	152	
KD2HE	*	105,780	263	41	131	
N2LEB	*	85,600	200	45	115	
W2YR	*	39,182	131	46	91	
K2CC	*	35,650	178	36	79	
			(Op: KC2BMG)			
KC2HZW	*	425	9	8	9	
W2/UR5DEM	**28**	**222,115**	**804**	**29**	**126**	
K2SX	*	204,279	512	27	122	
WB2BXO	21	4,080	43	16	32	
K3WW	**A**	**5,524,008**	**2590**	**163**	**623**	
AA1K/3	**"**	**4,161,241**	**2096**	**156**	**577**	
K3PP	**"**	**3,938,159**	**1994**	**151**	**576**	
AA3B	**"**	**3,627,942**	**2011**	**137**	**505**	
K2PLF/3	*	3,540,256	2077	135	499	
W3EEE	*	2,858,260	1891	126	467	
KQ3F	*	2,695,186	1628	136	462	
N3AM	*	2,546,565	1658	120	433	
W3MF	*	2,392,950	1454	129	473	
W3GM	*	2,207,590	1321	130	480	
K3NM	*	2,153,400	1420	120	462	
WT3W	*	1,997,910	1358	125	437	
W3FV	*	1,931,589	1334	119	418	
K3LP	*	1,832,782	1210	127	447	
NZ3O	*	1,771,566	1116	128	459	
W3EA	*	1,739,868	1399	117	377	
K3MD	*	1,564,171	1297	121	390	
NN3Q	*	1,411,457	1045	114	395	
N3NA	*	1,407,868	946	124	415	
N3ZA	*	1,382,349	873	129	462	
WT3P	*	1,308,160	1064	96	352	
K3CP	*	1,274,980	976	110	380	
W2UP/3	*	1,090,476	961	89	325	
WW3S	*	1,057,958	912	95	323	
K3JG	*	836,280	817	93	321	
W3FVT	*	625,504	674	84	268	
W3OV	*	602,751	709	76	255	
NY3C	*	593,021	693	77	242	
KU3X	*	549,328	650	72	232	
N4GG/3	*	512,388	584	76	255	
W3HVQ	*	432,708	476	109	319	
N3MK	*	249,061	368	54	209	
W3ZZ	*	195,278	345	63	188	
K3ATO	*	163,584	333	69	144	
K2YWE/3	*	156,972	221	61	193	
K3SV	*	156,782	243	77	200	
K3TG	*	98,644	213	60	122	
N3GNW	*	90,753	198	54	125	
W8FJ/3	*	46,443	130	36	101	
WE3C	*	34,744	134	24	77	
N3OK	*	20,790	83	37	68	
KB3FEE	*	189	11	4	3	
W4NF	**A**	**3,713,235**	**1996**	**144**	**543**	
K5KG/4	**"**	**3,021,850**	**1748**	**138**	**512**	
W4RM	**"**	**2,473,569**	**1772**	**118**	**435**	
K1PT/4	*	2,415,734	1468	136	490	
K4XR	*	1,757,796	1018	146	496	
K4YT	*	1,397,066	1030	118	384	
AA4V	*	1,357,839	1165	114	327	
K4OJ	*	1,130,514	933	97	365	
W3GQ/4	*	1,108,581	920	107	342	
WD4DDU	*	935,025	783	102	353	
K3KO/4	*	931,545	715	111	378	
N4WW	*	896,400	758	107	343	
N4VV	*	672,948	690	95	277	
KT4HN	*	616,372	535	106	340	
W4JAM	*	573,937	646	87	284	
WB4YDL	*	278,690	381	85	205	
NE4S	*	264,306	396	83	211	
N4DW	*	180,715	314	67	168	
AD4IE	*	176,616	340	53	145	
NN4K	*	143,451	301	57	150	
W4ZW	*	116,966	241	71	162	
K2SD/4	*	108,016	248	56	116	
KG4KZZ	*	30,281	120	37	70	
N4XMX	*	27,140	98	45	70	
KB9TKD/4	*	15,876	89	26	58	
N4XM	*	2,065	25	16	19	
K4EA	**28**	**934,728**	**1697**	**36**	**168**	
KO4MR	*	140,620	283	32	146	
W3NC/4	**21**	**210,253**	**489**	**32**	**135**	
N4CC	**7**	**103,709**	**296**	**31**	**106**	
N5JR	**A**	**1,771,921**	**1222**	**122**	**399**	
W5ZO	**"**	**1,580,261**	**1174**	**131**	**410**	
W5VX	**"**	**1,537,877**	**1136**	**130**	**427**	
N5PA	*	1,238,028	1129	105	347	
W5FL	*	1,042,265	834	111	374	
KM5VI	*	884,709	792	117	336	
N5ER	*	574,838	693	83	236	
W5GN	*	489,744	642	78	226	
N5MT	*	433,440	577	68	212	
K5GH	*	354,032	380	117	289	
N8SM/5	*	303,050	401	89	201	
K5NZ	*	279,702	286	94	275	
N0RQ/5	*	235,248	299	90	222	
K5HDU	*	68,890	178	57	109	
NE0P/5	*	65,340	169	63	102	
**N

JAPAN

JS3CTQ	A	3,696,291	2572	145	386
JR1AIB	"	2,461,887	2315	144	359
JH7XMO	"	1,670,340	1663	134	276
JA1PCY	"	967,146	1074	109	250
7L4IOU	"	400,425	537	108	177
JA3YPL	"	364,812	540	79	179
			(Op: JJ3TBB)		
JF2SKV	"	283,020	458	85	180
JN3SAC	"	280,311	474	66	157
JH5OXF	"	201,744	363	66	150
JA3PYC	"	96,837	227	58	111
JE1CKA	"	57,624	156	65	103
JG2REJ	"	7,564	46	22	39
JH7PKU	28	805,648	1748	37	135
JA7DNO	"	42,978	214	27	60
JH6WHN	"	12,496	66	23	48
JK3DGX	21	253,575	600	35	126
JL3VUL	"	218,639	629	32	99
JA2XCR	"	113,030	337	34	93
JA9VOK	"	93,654	402	28	71
JM1LPN	14	68,244	220	33	88
JG7AMD	"	25,256	114	25	57

JORDAN

JY9QJ	A	6,929,280	3968	140	500

LEBANON

OD5/OK1MU	3.7	86,022	373	12	69

TAIWAN

BW3/UA3VCS	28	202,188	789	30	86

EUROPE

ALAND ISLANDS

OH0NA	A	5,184	99	18	63
OH0MPO	14	592,122	1909	37	137
			(Op: OH3BU)		

AUSTRIA

OE1A	A	4,625,844	3129	156	638
			(Op: OE1EMS)		
OE2BZL	"	264,040	602	75	247
OE1TKW	"	16,626	81	38	64

BELARUS

EW1CQ	A	292,338	607	69	258

BELGIUM

ON4CAS	A	68,400	189	54	117
OT2T	21	788,116	1772	39	157
			(Op: DL2CC)		
ON4ATW	3.7	112,896	888	16	82

CROATIA

9A5Y	28	1,270,946	2461	39	175
			(Op: 9A3LG)		
9A2U	21	156,300	581	35	115
			(Op: 9A3ZA)		

CZECH REPUBLIC

OK2FD	A	2,224,464	1601	149	577
OK1FDY	"	625,408	742	103	345
OK1ES	28	113,918	335	35	123

DENMARK

OZ8AE	28	151,382	416	33	121
OZ4O	"	52,800	251	20	76

ENGLAND

G3LZQ	A	249,777	394	75	244
M1P	28	264,096	671	35	133
G0VXE	"	211,098	668	32	119
G3GAF	"	150,568	760	29	89
M0BJL	21	597,600	1640	37	143
M4R	14	235,340	1184	32	108
			(Op: G4AXX)		

EUROPEAN RUSSIA

RW3DU	A	741,008	1031	101	363
RD4M	"	718,647	880	114	307
			(Op: UA4LU)		
RN4WA	"	407,002	706	96	298
RU3AT	"	26,880	87	55	85
UA6ADC	28	744,900	2039	40	151
RW4LR	21	35,595	388	24	81
RA6CM	3.7	98,175	635	26	93
RW3GB	1.8	26,666	399	10	57
RN6BN	"	17,085	221	9	58

FINLAND

OH6NIO	A	1,986,600	1540	127	489
OH6MSZ	"	610,963	999	99	334
OH2BR	"	4,002	32	19	27
OH6NJ	28	111,054	298	32	134
OH5B	14	621,432	1861	39	150
			(Op: OH5BM)		
OH9XX	3.7	32,120	456	11	62
OH2BO	1.8	9,412	179	8	44

FRANCE

TM2V	A	4,374,500	2973	134	516
			(Op: F6GYT)		
F8CMF	"	877,866	1280	84	198

GERMANY

DL6FBL	A	5,409,850	3084	160	682
DL8WW	"	4,031,384	2505	153	593
			(Op: DK3GI)		
DJ2YA	"	2,840,489	1728	152	591
DF4RD	"	2,425,444	1533	147	574
DL1YD	"	1,974,861	1535	121	446
DL1NEO	"	1,258,488	1292	92	412
DF6QV	"	1,022,826	1132	102	395
DL8NFU	"	898,700	1145	95	380
DF6QN	"	880,396	1025	103	381
DH9SB	"	866,022	995	98	400
DL8AAM	"	438,515	787	72	263
DF5ZV	"	324,968	522	81	311
DL8OBF	"	232,092	558	67	240
DL3BQA	"	228,852	376	85	241
DL1TC	"	195,776	294	83	239
DL2LAR	"	107,361	263	55	182
DL9NCR	"	53,196	171	50	106
DL7NFK	"	51,019	168	51	112
DF2AP	"	43,358	180	42	121
DK8NX	"	14,766	70	45	62
DF2LH	28	190,632	509	35	134
DK4VW	"	167,745	441	31	128
DF9ZP	21	861,745	2110	39	154
DH5HV	"	480,480	1242	38	144
DJ7EO	14	704,866	1865	40	157
DJ9MH	"	28,500	216	19	81

HUNGARY

HGSC	28	742,850	1820	38	141
			(Op: HA5WE)		
HA3NU	21	727,982	1992	37	144

ITALY

IKØYUT	A	2,272,345	1948	126	515
IK1RQT	"	1,949,346	1890	115	452
I2SVA	"	1,725,504	1539	115	413
IZ2DPX	"	458,311	681	85	196
I2ODL	28	682,831	1650	38	135
			(Op: IK2YSA)		
IU3A	"	411,230	974	34	136
			(Op: IV3HAX)		
IZ4AFW	"	131,985	502	25	79
IQ3X	21	534,737	1832	36	137
			(Op: IV3SKB)		
IC8POF	3.7	52,836	545	13	71

JERSEY

GJØNYG	A	713,174	1019	80	341

LATVIA

YL1ZF	3.7	106,752	1052	21	75

LITHUANIA

LY2CY	A	421,126	557	93	293
LY2CX	"	63,000	178	49	126
LY2IJ	21	530,792	1476	36	136

MACEDONIA

Z39Z	3.7	183,727	922	17	84
			(Op: Z32AF)		

NETHERLANDS

PAØKHS	A	311,459	612	66	227
PA9ZZ	"	281,562	624	64	217
PA3FDO	"	26,838	124	41	85

NORTHERN IRELAND

GI5W	A	7,364,135	5682	150	589
			(Op: MØSDX)		
GI4XSF	"	214,085	514	54	181
GI4VIV	"	105,092	308	50	138
GIØHWO	"	30,186	161	37	92

POLAND

SP4Z	A	988,380	991	136	442
			(Op: SP4EEZ)		
SP8NR	"	966,038	936	112	356
SP9LAS	"	198,949	490	61	222
SP3LWP	28	177,957	501	38	131
SN8V	14	692,098	2118	39	154
			(Op: SP8GQU)		
SP9LJD	"	406,374	1288	38	140

ROMANIA

YO3JF	28	53,790	222	33	77

SARDINIA

ISØIEK	A	4,408	65	16	42

SICILY

IT9STX	14	526,604	1886	32	132

SLOVAK REPUBLIC

OM5A	A	3,706,748	2852	148	574
			(Op: OM3LA)		
OM8A	"	2,853,144	2152	137	511
			(Op: OM3RM)		
OMØR	28	1,058,521	2314	38	161
			(Op: OM3GI)		
OM7PY	"	88,101	315	32	85

SLOVENIA

S5ØS	A	5,372,406	3805	150	552
			(Op: S51TA)		
S52ZW	"	4,442,397	2994	148	595
S59V	"	208	8	8	8
S5ØR	21	657,746	1728	37	136
S53M	14	673,360	1941	37	153
			(Op: S51ZO)		
S51CK	"	488,444	1746	38	149
S58M	7	216,064	1309	27	101

SPAIN

EA3OA	A	793,712	1217	87	352
EA3EJI	"	630,800	861	97	318
EA5FID	"	454,848	543	103	309
EA1JW	"	36,873	166	35	118
EA5EG	"	28,495	105	49	90
EA5QV	28	272,916	733	33	138
EA7AKK	"	158,848	602	34	112
EA1BHQ	"	99,774	294	31	107
EA5YJ	21	203,496	808	32	107

SWEDEN

SM7E	A	757,230	1086	93	337
			(Op: SM7BHM)		
SM5IMO	"	266,475	553	57	218
SM5S	7	53,352	328	26	91
			(Op: SM5SIC)		

SWITZERLAND

HB9FBS	A	487,602	1285	66	243
HB9HFM	"	132,525	433	51	174

UKRAINE

UT7L	A	2,077,694	1971	142	484
			(Op: UXØLL)		
UU2JQ	"	35,953	135	46	111
EM3J	28	806,930	2019	37	153
			(Op: UU2JZ)		
UXØIB	21	194,040	739	35	119
EO1I	"	39,292	230	27	67
			(Op: UT1IA)		
UT7QF	14	804,121	2294	40	171
UW5Q	"	734,022	2288	39	158
			(Op: UR3QCW)		
UZ7U	3.7	74,340	772	15	75
			(Op: UT3UA)		
UT5UGR	1.8	42,966	618	11	66

YUGOSLAVIA

YZ1AU	A	201,096	893	33	100
YU1UA	1.8	324	13	5	13

OCEANIA

HAWAII

KH6/K1ER	A	223,214	393	80	153
AH6NF	"	43,569	136	59	82

NEW ZEALAND

ZL3GA	28	48,034	238	25	48

PHILIPPINES

4D7ØSAN	A	121,095	397	50	85
			(Op: DU1SAN)		

SOUTH AMERICA

ARGENTINA

AY8A	A	1,142,768	1237	87	257
			(Op: LU8ADX)		
LP7H	28	1,096,032	2502	34	134
			(Op: LU9HS)		
L59EOC	"	611,456	1840	28	100
			(Op: LW9EDC)		
LU2BA	"	240,331	632	35	104
LU4HW	"	102,779	519	24	55
L21I	21	1,962,310	3723	40	154
			(Op: LU7DW)		
LTØH	14	224,334	907	31	68
			(Op: LU3HY)		
LW5EE	"	181,860	495	33	107

ARUBA

P4ØP	A	12,975,732	6639	154	528
			(Op: W5AJ)		

BRAZIL

PX2W	A	4,367,130	3147	122	388
			(Op: PY2YU)		
PY2TNT	"	369,024	848	51	135
PU2MXU	28	76,536	461	20	52
PY2WC	14	889,165	1989	37	126

PARAGUAY

ZP6Y	A	1,850,421	2411	85	218
			(Op: ZP5AZL)		

MULTI-OPERATOR SINGLE TRANSMITTER

NORTH AMERICA

UNITED STATES

K1IR	4,836,000	2562	145	599
N1MM	4,569,120	2509	136	548
W1BK	1,811,232	1120	134	474
W1FM	637,478	664	86	293
KK1L	412,620	512	68	208
W6FC/1	371,862	511	68	215
W1BIH	260,103	377	84	229
K2UA	3,151,570	2068	132	433
W2ZO	2,251,951	1531	132	425
K2OWE	1,880,068	1223	127	487
W2LC	1,290,480	1073	107	349
AE2F	1,097,016	811	111	405
KA2NDX	1,088,281	1013	104	335
N2AUK	805,302	927	110	376
N2BA	632,654	623	86	300
WB2KHO	502,383	587	79	250
WB2ELW	412,952	519	90	238
WA2IZL	58,506	305	47	100
NE3F	3,250,397	2004	145	537
WT3Q	1,750,436	1423	116	362
W3LJ	712,504	709	92	311
K3BSA	668,315	707	91	274
W3LRC	94,620	274	49	141
K3PZN	17,544	94	38	64
W3SO	13,179	74	24	45
N4PN	6,490,108	3352	159	614
W4WS	3,778,620	2141	147	563
KY5R/4	3,366,400	2085	134	506
WD4K	2,988,710	1960	147	475
K9ES/4	2,371,266	1648	133	485
W2YE/4	1,482,120	1205	110	350
NY4T	883,440	909	103	306
W4TE	184,146	300	82	200
WG4Y	50,160	143	54	111
N5YA	4,041,066	2517	145	509
N1LN/5	2,797,200	2012	151	515
K5UTD	882,752	958	109	307
KK5K	241,736	477	77	191
AE5DL	182,535	332	65	150
WX5II	116,127	216	60	147
K6ZM	1,113,552	1428	106	227
K6KO	1,007,382	880	127	316
K6VO	882,384	920	117	255
W6YRA	90,454	389	59	83
W7VJ	1,416,987	1395	127	302
N7YX	948,060	1088	106	239
K7ZSD	926,220	880	124	306
WX7P	632,736	788	97	241
K7UQT	503,808	585	100	228
W7AL	282,846	725	38	139
K8AZ	6,027,318	2832	168	635
NØFW/8	2,560,338	1505	158	579
K8CC	2,370,701	1509	141	488
WD8X	513,300	593	92	256
N8BI	371,160	404	95	265
NO8I	295,647	499	75	214
WC8VOA	179,578	431	75	179
KD9ST	2,630,438	1626	147	475
WN9O	1,913,826	1215	138	509
KC9CCQ	379,440	549	90	216
NØNI	4,932,074	2529	166	616
KØRF	4,540,791	2295	169	610
KTØR	846,387	756	122	349
KØUK	747,252	727	127	332

ALASKA

AL1G	626,465	1236	76	169

BARBADOS

8P8P	20,065,950	9877	172	678

BERMUDA

VP9I	3,918,483	3923	111	348

CANADA

VE3RM	5,235,862	3693	133	484
VE7SV	4,282,595	3638	150	399
VA3SK	3,958,175	2892	141	500
CK6SV	3,264,000	3133	132	380
VE3MIS	884,101	1192	76	255

HONDURAS

HQ3J	2,337,920	3343	94	226

MONTSERRAT

VP2MPA	11,730,896	7426	147	559

TURKS & CAICOS ISLANDS

VP5B	12,449,052	8307	153	540
VP5DX	10,788,115	6645	155	596

AFRICA

CANARY ISLANDS

EA8ZS	20,869,812	8061	176	742
EA8OK	8,459,721	5058	137	502

MADEIRA ISLANDS

CT9Z	441,975	823	48	154

SOUTH AFRICA

ZSØM	2,443,716	2310	100	274

ASIA

ASIATIC RUSSIA

RT9W	7,254,444	3895	146	585
RW9OWD	3,204,486	2905	114	363
RZ9SWP	1,654,240	1675	94	328
RK9JWV	856,216	1038	85	259
RN9WWW	465,984	640	64	224
RZ9UWZ	197,372	488	52	144

ASIATIC TURKEY

YM3WW	2,090,024	2450	69	247
TA2KK	310,236	734	54	197

AZERBAIJAN

4K7Z	681,075	1293	60	193

CHINA

B4R	2,712,387	2865	142	395
BY6HY	355,200	1029	92	204
BY6DX	215,628	491	78	160

CYPRUS

P3A	19,647,550	8891	160	675
P39P	1,554,614	1908	61	253

GEORGIA

4LØG	6,308,588	4609	128	444

JAPAN

JA7YAA	3,387,258	2139	156	453
JI2ZJS	3,298,572	2444	141	390
JJ3YBB	2,972,580	2656	140	375
JE6ZIH	2,864,680	2309	140	380
JA2ZJW	2,828,028	2054	139	375
JI2ZEY	1,490,338	1516	121	276
JA9YAA	790,400	826	127	289
JA4YHX	453,894	577	109	212

KAZAKHSTAN

UN8LA	2,473,443	2225	117	366
UN5GC	1,771,821	1522	108	371

KOREA

HL0CAC	200,160	586	78	162

KYRGYZSTAN

EX9A	5,085,459	4002	121	426

TAIWAN

BV2B	439,808	1205	83	173

EUROPE

AUSTRIA

OE2S	7,951,680	4471	168	712

BELARUS

EW8ZZ	60,192	337	40	136

BELGIUM

OT2L	6,172,980	3694	156	640
OT2P	2,352,220	2497	119	426
OT2O	568,320	986	82	288
OT2H	496,713	899	68	259

BULGARIA

LZ9W	7,789,596	5127	165	688
LZ1ABC	1,299,375	1829	108	387

CRETE

J49Z	6,700,980	5689	150	631

CROATIA

9A1P	8,750,095	5175	156	673
9A1DAB	3,000	90	11	39

CZECH REPUBLIC

OK5W	9,372,156	4921	177	737
OL7R	3,966,649	3130	136	531
OL5Q	3,534,894	2933	129	465
OK6A	1,445,076	1578	119	429
OL2A	1,105,592	1543	98	354
OK2KJU	1,042,532	1191	111	415
OL7C	416,232	1096	74	254
OL2U	235,572	605	64	204
OK1KMG	145,222	593	49	204

DENMARK

OZ5E	3,036,618	2588	145	596
OZ5ESB	1,462,880	2028	91	319
OZ5BAL	175,617	361	57	190

ENGLAND

M5ZAP	3,461,960	3265	122	445
G9O	2,144,550	3077	93	342
G3B	2,102,229	2053	110	421
G6PZ	2,094,492	2301	106	397
M2W	1,926,771	2606	92	347
G4UJS	1,219,218	1327	100	362
M8C	611,665	1082	83	272
M4U	209,306	538	50	179
G3YNN	20,615	161	43	90

ESTONIA

ES6Q	8,084,832	4647	182	726
ES2U	1,089,612	1483	107	406
ES6T	577,368	964	85	311

EUROPEAN RUSSIA

R5CC	8,976,252	5194	174	785
RL3A	5,700,732	3651	172	680
RO4M	5,675,512	4315	161	633
RU6LWZ	3,986,411	3081	164	629
RF3A	3,927,100	3549	139	553
RK6AXB	2,337,462	2380	133	506
RU6LWT	1,550,808	2108	124	419
RK4WWA	1,258,861	1933	114	409
RD3R	941,235	1614	92	301
RK3WWA	838,030	1468	104	359
RK3QWM	741,272	1343	95	339
RK6AYN	640,700	1134	88	342
RK6LZS	476,930	1065	81	289
RZ4AYT	240,300	649	71	229
RK4CWA	135,810	387	66	204
RK1NWA	53,055	334	29	102

FINLAND

OH6K	912,456	1678	98	358

FRANCE

TM5C	12,661,826	6155	180	742
TM2E	3,597,126	4167	101	330
F6KDF	3,457,953	3015	140	559
F8KCF	1,923,255	1971	108	433
F8KGM	1,671,964	1831	119	447
F5KDC	1,632,806	1816	125	398
F5KSE	784,044	1230	78	270
F5KIN	508,662	779	78	289
TM2S	300,015	584	80	259
F8KGH	245,052	701	62	212
TM5HV	155,536	618	60	232

GERMANY

DL2NBU	8,634,180	4382	171	735
DL2ARD	4,741,920	3446	152	588
DLØAO	3,888,522	2743	148	590
DL8OH	3,419,664	2587	158	588
DK1MM	3,050,827	2165	140	569
DLØDX	1,262,562	1312	101	382
DL1RYD	1,261,234	1486	111	431
DKØALK	1,119,960	1656	83	277
DKØOVL	817,664	1271	113	399
DN3YD	126,256	351	53	155

GREECE

SY8A	9,037,980	6997	152	604

HUNGARY

HG1S	8,696,104	4915	167	589
HG9M	593,118	1214	84	313

ICELAND

TF3IRA	1,041,716	2066	66	233

IRELAND

EI9E	737,661	1024	80	313

ITALY

IQ4A	10,825,835	5397	175	712
IU2X	8,134,400	4817	156	619
IQ4T	6,936,984	4194	161	667
IO4T	4,464,725	3330	135	524
IU4U	4,270,492	3095	137	564
IQ2C	3,282,280	2732	127	493
IQØN	2,209,520	2110	127	441
IZØBVU	1,570,311	2390	105	342
I3GWE	1,196,520	1706	105	367
IR3A	621,712	973	92	272
II3L	334,647	816	71	238
IK3SCB	204,240	604	59	171

LATVIA

YL7C	1,038,202	1506	91	360
YL1ZS	655,313	1126	90	293
YL1XN	20,212	226	27	97

LUXEMBOURG

LX7DX	1,038,768	1519	94	362

MOLDOVA

ER3R	1,828,484	2327	111	421

NETHERLANDS

PA7MM	5,976,729	3877	155	648
PA9KT	4,296,210	3656	142	568
PI4DEC	1,265,506	1848	103	403
PI4KAR	9,215	146	32	65

NORWAY

LA2Z	1,913,517	2117	113	428
LA1TUR	50,718	307	37	121

POLAND

SO2R	8,694,987	4411	184	719
SPØPZK	1,763,937	2031	115	452
SP5KVW	1,511,264	1689	123	446
SP6HTQ	1,087,212	1200	111	405
SP9KDA	907,018	1226	110	408
SNØOTC	537,340	998	88	313
SN8D0R	466,264	921	91	258
SP9KDU	426,894	749	73	265
SP6KFA	398,430	853	80	262
SP8YCB	58,645	253	50	135
SP3KPN	4,880	70	21	40

PORTUGAL

CS6RPA	1,161,864	1858	76	248
CQ2T	362,700	829	72	253

ROMANIA

YO6KNY	27,707	207	24	79
YO9KPM	13,688	173	32	84

SICILY

IR9U	3,905,004	4502	109	383
IT9EWG	1,376,746	2211	85	321
IT9GNG	1,330,334	1457	109	390

SLOVAK REPUBLIC

OM7M	7,506,360	4350	168	702

SLOVENIA

S53O	7,085,707	4765	159	652
S5ØC	4,618,652	3343	142	564

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S53F	2,550,867	2802	110	451
S53EA	2,390,312	2304	119	465
S51S	920,804	1403	93	329
S59Q	378,371	885	68	215
SPAIN				
EA1EEY	**7,460,074**	**4466**	**152**	**614**
EA4URE	**3,647,616**	**3101**	**137**	**535**
EA1COZ	**3,422,432**	**2744**	**133**	**475**
EA3RKG	1,906,476	2252	107	377
ED1BD	1,782,162	2208	95	291
EA7DIU	1,759,172	3249	71	222
ED1CL	1,516,320	1499	112	428
EA5KB	1,456,832	2045	93	319
EA1FCI	1,324,960	1838	87	305
ED2WWW	810,768	1580	73	231
ED1SML	747,024	1620	68	248
EA4RKU	452,636	704	78	284
ED5PAC	431,503	1399	65	192
EA1FCR	429,994	805	70	256
EA3URC	366,450	814	77	273
EA7GXW	123,369	350	53	124
SWEDEN				
SL2ZA	**1,409,832**	**1718**	**102**	**386**
SI9AM	**1,278,343**	**1905**	**90**	**373**
SM5U	515,619	786	91	260
SK6HD	93,795	304	45	140
SWITZERLAND				
HB9OK	**3,307,005**	**3321**	**120**	**465**
UKRAINE				
EN7Z	**7,067,016**	**5248**	**158**	**634**
EMØU	**1,357,330**	**2078**	**117**	**413**
UR4IZA	920,802	1261	115	383
US8Q	489,549	954	77	254
UX8IXX	421,470	1167	84	294
US8IZM	367,760	954	78	277
UR4PWC	33,712	196	29	83
UT4UXW	1,378	49	7	19
YUGOSLAVIA				
4N1N	**2,701,272**	**3167**	**123**	**465**
YTØX	**2,179,408**	**1886**	**129**	**487**
4N1SM	2,106,865	2340	124	391
YU1HFG	326,895	915	72	213

OCEANIA

AUSTRALIA				
VK6ANC	**942,952**	**1134**	**97**	**214**
INDONESIA				
YBØZDD	**3,443,955**	**3235**	**113**	**326**
NORTHERN MARIANAS				
KHØAA	**12,599,064**	**6872**	**158**	**490**

SOUTH AMERICA

ANTARCTICA				
R1ANC	**62,046**	**276**	**33**	**48**
ARGENTINA				
LRØN	**6,700,200**	**4233**	**134**	**466**
LU2FA	873,600	1327	83	177
LU5HM	434,280	1143	36	118
L79H	267,948	1187	28	80
BRAZIL				
ZY7C	**3,910,450**	**3644**	**100**	**294**
PT2CM	1,809,260	2456	82	223
ZV5K	1,158,057	1809	80	181
PY2GEC	1,066,590	1984	61	149
PY2ZR	256,780	671	42	106
PY7AA	130,704	465	36	76
CHILE				
CE3N	**2,804,736**	**3211**	**94**	**238**
GALAPAGOS ISLANDS				
HC8A	**22,511,664**	**9793**	**174**	**654**
PERU				
OA4O	**6,348,400**	**4530**	**139**	**399**

MULTI-OPERATOR TWO TRANSMITTERS NORTH AMERICA

UNITED STATES				
KI1G	**9,920,961**	**4375**	**169**	**668**
K1KI	**9,626,703**	**4610**	**162**	**645**
KØTV/1	4,750,680	2742	144	564
N1RR	3,067,428	2195	128	418
K1NU	2,279,952	1448	123	445
W1SRG	1,153,450	1036	97	328
KV1W	1,136,665	859	119	372
N2NT	**9,834,670**	**4601**	**167**	**663**
W2XL	**2,639,826**	**1807**	**124**	**450**
W2CG	1,626,408	1200	118	386
N3RS	**11,461,072**	**5137**	**172**	**696**
K4JA	**11,091,128**	**4780**	**178**	**714**
NQ4U	906,347	983	104	299
K5NA	**4,924,576**	**2944**	**167**	**569**
AA5NT	**4,116,016**	**2588**	**154**	**538**
W5KFT	3,385,800	2926	143	427
W6KK	6,957,630	3859	163	567
W6EEN	**3,201,340**	**2429**	**142**	**448**
W6YX	2,935,242	2176	141	396
W6UE	2,293,620	2015	141	375
KA6BIM	1,666,441	1461	129	350
K6IDX	1,277,200	981	135	361
W7DX	**3,595,414**	**2445**	**158**	**476**
NK7U	**2,764,586**	**1956**	**146**	**437**
W8FT	102,512	271	51	121
ANTIGUA				
V26B	**18,756,933**	**11124**	**156**	**585**
BAHAMAS				
C6ARB	**3,487,624**	**4556**	**105**	**287**
BARBADOS				
8P2K	**3,767,610**	**3694**	**114**	**376**
CANADA				
VY2SS	**7,789,545**	**4754**	**142**	**563**
VE3DC	**3,855,840**	**2994**	**133**	**447**
VE6FI	**2,656,788**	**2956**	**121**	**349**
VE6AO	1,292,205	2176	95	216
VE2/KD3RF	858,408	1582	69	213
VE7OSO	**449,160**	**1045**	**77**	**151**
COSTA RICA				
TI8/K4QFF	**2,261,976**	**3781**	**90**	**217**
CUBA				
CO8LY	**1,684,686**	**2465**	**94**	**260**
DOMINICAN REPUBLIC				
HI9X	**5,446,540**	**6390**	**112**	**306**
ST. KITTS & NEVIS				
V47NS	**11,531,688**	**7154**	**134**	**530**
U.S. VIRGIN ISLANDS				
NP2B	**12,355,245**	**9114**	**145**	**498**

AFRICA

ASCENSION ISLAND				
ZD8Z	**24,897,950**	**11284**	**166**	**604**
MADEIRA ISLANDS				
CT9L	**22,064,112**	**9559**	**164**	**662**

ASIA

ASIATIC RUSSIA				
RK9CWW	**8,235,462**	**4437**	**144**	**573**
JAPAN				
JA6ZPR	**3,306,821**	**3255**	**126**	**387**
JO1ZYI	87,792	452	28	65
JR1ZTT	67,497	264	53	98
JA7YFB	3,690	41	20	21
KOREA				
HLØJHQ	**425,115**	**1097**	**81**	**154**
SINGAPORE				
9V1YC	**1,835,777**	**1881**	**118**	**349**

EUROPE

ALAND ISLANDS				
OHØZ	**9,191,628**	**6331**	**163**	**665**
AUSTRIA				
OE5T	**5,771,345**	**4462**	**157**	**612**
CROATIA				
9A7A	**13,292,224**	**7761**	**173**	**696**
CZECH REPUBLIC				
OK2KDS	**1,525,719**	**1611**	**114**	**437**
EUROPEAN RUSSIA				
RU1A	**13,160,616**	**7684**	**184**	**747**
RZ1ZZZ	1,755,056	2150	116	342
FRANCE				
TM2Y	**12,863,878**	**7372**	**172**	**691**
TM6WW	921,484	1374	94	334
GERMANY				
DF7ZS	**1,832,104**	**1720**	**119**	**477**
DL4FAY	1,352,192	1279	112	444
GUERNSEY				
MUØC	**12,178,992**	**8019**	**153**	**651**
HUNGARY				
HG6N	**11,294,944**	**7200**	**167**	**696**
ISLE OF MAN				
MD4K	**10,417,968**	**7906**	**159**	**633**
ITALY				
IR4T	**13,508,030**	**7049**	**176**	**729**
JERSEY				
MJ/DL1EK	**5,403,792**	**5314**	**112**	**506**
KALININGRAD				
RW2F	**14,163,303**	**8072**	**189**	**742**
LITHUANIA				
LY1YK	**5,337,912**	**4484**	**163**	**625**
LUXEMBOURG				
LX5A	**10,842,868**	**6511**	**162**	**682**
NORWAY				
LN1K	**217,621**	**700**	**57**	**212**
POLAND				
SO6Y	**1,508,542**	**1579**	**113**	**441**
SCOTLAND				
GM2T	**940,918**	**1366**	**87**	**331**
SWEDEN				
SK3W	**7,179,840**	**4920**	**165**	**645**
SWITZERLAND				
HB9H	**8,527,542**	**6021**	**153**	**609**

OCEANIA

AUSTRALIA				
VK1JDX	**145,008**	**340**	**67**	**145**
CHATHAM ISLAND				
ZL7C	**6,249,152**	**5417**	**116**	**300**
GUAM				
AH2R	**12,558,232**	**6862**	**162**	**502**
NEW ZEALAND				
ZL6QH	**2,949,072**	**2708**	**123**	**279**
OGASAWARA				
8N1OGA	**2,279,552**	**3886**	**107**	**245**
SOUTH COOK ISLANDS				
ZK1CG	**2,511,243**	**3073**	**100**	**209**

SOUTH AMERICA

ARGENTINA				
LT1F	**8,567,690**	**6194**	**139**	**423**
LT5H	3,197,805	3676	94	251
BRAZIL				
ZW5B	**16,201,515**	**8156**	**160**	**585**
NETHERLANDS ANTILLES				
PJ2T	**28,415,835**	**12916**	**161**	**628**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

UNITED STATES				
KC1XX	**19,390,428**	**8033**	**188**	**784**
W3LPL	**17,683,044**	**7491**	**188**	**760**
K9NS	**16,150,140**	**6941**	**189**	**751**
N4TO	**13,218,114**	**6229**	**178**	**725**
N2RM	**12,788,160**	**5737**	**177**	**703**
W4MYA	**10,575,400**	**4875**	**180**	**694**
K1RX	**9,172,730**	**4516**	**169**	**657**
K1TTT	8,616,960	4435	167	649
KB1H	7,437,285	3583	160	641
W3PP	**7,020,260**	**3671**	**163**	**643**
W2AX	**6,948,576**	**3717**	**152**	**584**
K3ANS	5,723,984	3053	166	618
N3AD	5,514,240	3301	153	565
W8ZA	**5,118,309**	**2690**	**153**	**576**
K3DI	4,109,738	2280	150	553
KØIR	**3,329,750**	**2375**	**161**	**540**
K3CT	1,238,160	1119	94	346
NS2P	832,048	848	91	300
ANGUILLA				
VP2E	**7,131,460**	**4096**	**157**	**609**
CANADA				
VC2C	**9,942,640**	**8045**	**139**	**453**
VE7SCC	**3,098,700**	**3718**	**124**	**326**
VE5RI	**2,841,696**	**3519**	**110**	**306**
VE7ZZZ	2,414,652	3529	109	263
COSTA RICA				
TI5N	**18,748,114**	**11658**	**160**	**582**
GRENADA				
J3A	**14,528,172**	**9525**	**146**	**552**
TURKS & CAICOS ISLANDS				
VP5T	**10,321,920**	**8059**	**128**	**448**

AFRICA

AFRICAN ITALY				
IH9P	**49,469,160**	**17780**	**188**	**800**
MADEIRA ISLANDS				
CQ9K	**31,004,311**	**13259**	**177**	**724**

ASIA

CHINA				
BY4BJA	**4,947**	**199**	**22**	**29**
JAPAN				
JA3YBK	**12,326,301**	**6155**	**170**	**599**
JA5BJC	**9,181,365**	**5109**	**170**	**529**
JA7YRR	**6,472,883**	**4277**	**161**	**458**
JA1YPA	**5,273,532**	**3447**	**158**	**463**
JA1KQX	595,935	703	105	264
JJ1YAF	3,306	57	25	33
MACAO				
XX9C	**5,918,857**	**5887**	**150**	**457**
UNITED ARAB EMIRATES				
A61AJ	**33,377,700**	**13376**	**186**	**784**

EUROPE

BELGIUM				
OT2A	**15,491,868**	**9744**	**175**	**728**
CORSICA				
TK4Z	**14,440,401**	**11255**	**138**	**589**
CZECH REPUBLIC				
OL5T	**7,702,565**	**5532**	**155**	**660**
OK1GK	1,566,189	1986	103	410
GERMANY				
DFØHQ	**16,503,110**	**9682**	**185**	**777**
DHØDX	4,854,756	3686	139	569
DLØKC	2,474,910	2400	130	512
LATVIA				
YL4U	**2,418,693**	**2597**	**127**	**506**
LIECHTENSTEIN				
HBØ/HB9AON	**8,743,140**	**7102**	**143**	**613**
LITHUANIA				
LY7A	**7,972,731**	**6136**	**164**	**657**
NORWAY				
LN4C	**4,137,800**	**4462**	**132**	**548**
POLAND				
SN4L	**3,478,810**	**4082**	**131**	**531**
SP3KFH	1,854,210	1623	124	446
SARDINIA				
ISØA	**703,836**	**1570**	**76**	**302**
SCOTLAND				
GM5A	**9,293,412**	**7306**	**154**	**653**
GMØB	3,768,775	4260	133	514
SLOVAK REPUBLIC				
OMØM	**1,598,056**	**1924**	**109**	**315**
SLOVENIA				
S55W	**3,031,712**	**3058**	**112**	**432**
SPAIN				
ED7VG	**9,280,804**	**8018**	**139**	**537**
EA4TV	1,169,489	2072	77	276
EA2URV	293,828	928	61	237

OCEANIA

HAWAII				
KH7R	**28,795,122**	**13391**	**190**	**584**
NORTH COOK ISLANDS				
ZK1MA	**6,152,212**	**5556**	**126**	**281**

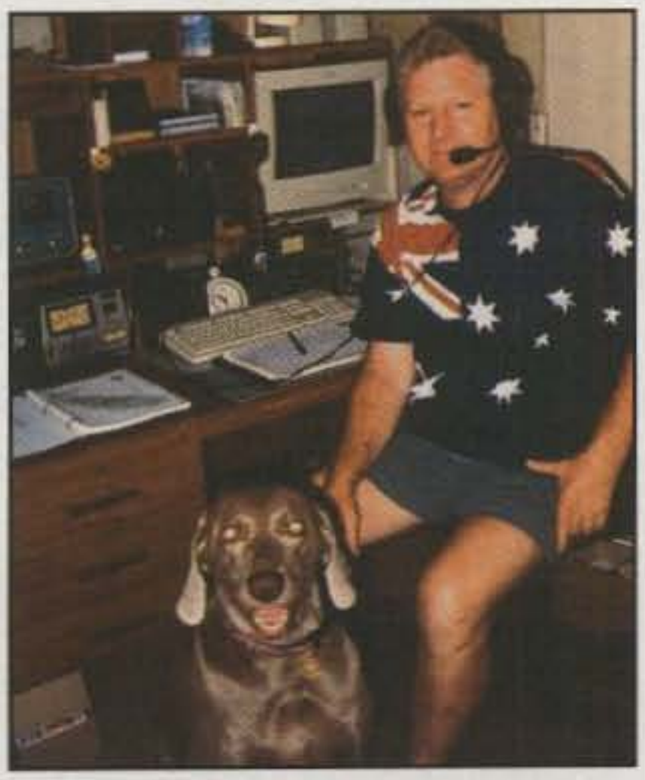
SOUTH AMERICA

ARGENTINA				
LU4FM	**13,843,286**	**8271**	**156**	**518**
BRAZIL				
ZW5UF	**510,547**	**1681**	**36**	**103**
PY3MHZ	59,808	289	25	64
URUGUAY				
CV5D	**1,401,456**	**2390**	**80**	**221**
VENEZUELA				
YV4A	**25,461,886**	**11970**	**168**	**650**

Craig, FS/AH8DX, #7 World Single Op, All Band, High Power.

BY1DX operated by Harry, OH6YF.

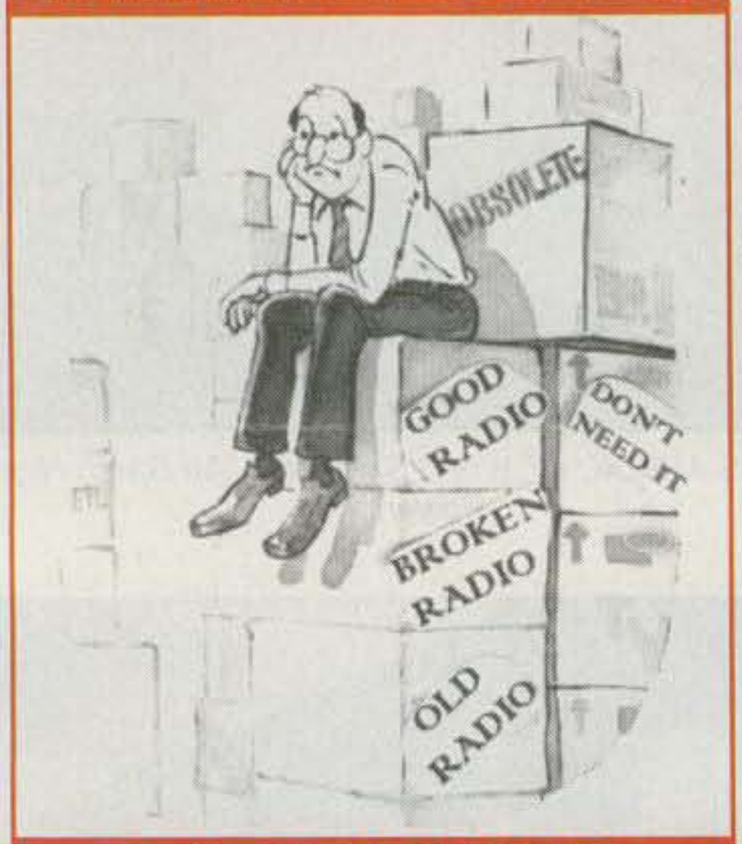
Bernie, VK4EJ, with his S&P op.



CHECK LOGS

3Z1Z, 4X6HP, 4Z5FL, 4Z5ML, 4Z8GZ, 8SØF, A45XR, AA6TT/1, AH7R, D44AC, DH5MM, DL2RVD, DL5KUA, DL7BW, DL7UCX, DL7VMM, DL8AXJ, EA1CBX, EA4AVM, EA4GL, EA4YT, EA5VR, EA5WI, EA7FUH, EA7SL, EA8DO, EA8ZZ, EA9CD, EW8OS, G3NXT, G3YOG, GM3YOG, HA1AG, HK3DDD, IZ2DPX, K2CBI, K2EPL/7, K5KA, K7JA/6, K9HY, KE8RO, KFØU, KF6IIU, LA4IFA, LA4WJ, LA5JS, LA6PBA, LA7FD, LA7FJA, LA9NM, LA9RY, LA9TJA, LY1DF, LZ1JZ, LZ2DD, LZ2HN, LZ4UU, OH2EM, OH3HAE, OK2BDF, OK2UGY, OK2VX, ON6CQ, OZ1FAO, PAØRBO, PAØVRA, PA5TT, PJ7/K7ZUM, PT2PS, PU2OCZ, PY2DBU, PY3ADM, RAØFN, RA1OCZ, RA3ZH, RA3ZZ, RA9FF, RK3BA, RK9TWA, RU6MM, RU9BB, RV6AJO, RV9BI, RWØBG, RZ9SWR, S53EO, SMØBNK, SM5ENX, SM6KMD, SP2AVE, SP2GKQ, SP3BVA, SP3CNP, SP3JUN, SP3MEP, SP3PLD, SP4HHI, SP4IGV, SP6BEN, SP6CDP, SP7XK, SP8DA, SP8HKT, SP8YRZ, SP9CVY, SP9SOU, SQ1EID, SQ2FOR, SQ4AT, SV1XV, UA1RG, UA3DEE, UA3FDX, UA3TCJ, UA4RC, UA6JCC, UA8JLL, UR5ZIB, UR5ZUQ, UR7QR, UUØJC, UX1IL, VE9DX, VQ9X, W3QY, W7LBN, W7LBV, W8TTS, W8UE, WA5CHX, WP2Z, YL2SM, YO2NAA, YO3BMJ, YO3CCC, YO6ADW, YO6CFB, YO6ODN, YO8SAO, YZ1AU, YZ1EW.

SITTING ON A TAX WRITE-OFF?



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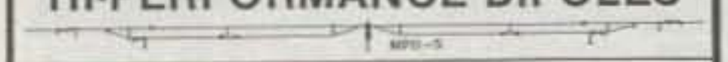
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In our June article on VHF hilltopping, "The Hills are Alive With the Sound of VHF DX," we mentioned that there are two websites that offer specialized information on designing your own high-performance VHF Yagi antennas, but then forgot to give you the addresses for those websites. They are: <http://www.fredspinner. com/W0FMS/CheapYagi/vjbcy.html> and <http://www.cebik.com/radio.html>. We regret any inconvenience or frustration.

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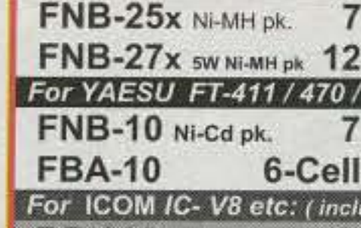

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